Appendix C

Essential Fish Habitat Assessment

Table of Contents

List of Tables

List of Figures

List of Acronyms and Abbreviation

CYA	collocated "Y" assembly
DO	dissolved oxygen
EEZ	Exclusive Economic Zone
EFH	essential fish habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FMP	Fishery Management Plan
HAPC	habitat areas of particular concern
HRE	Hudson-Raritan Estuary
LNG	liquefied natural gas
LNGRV	LNG regasification vessel
MAFMC	Mid-Atlantic Fishery Management Council
MARMAP	Marine Resources Monitoring, Assessment, and Prediction
mg/L	milligrams per liter
MP	milepost
MSA	Magnuson-Stevens Act
NEFMC	New England Fishery Management Council
NEFSC	NOAA Fisheries Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NTU	nephelometric turbidity unit
OCS	Outer Continental Shelf
PLEM	pipeline end manifold
psu	practical salinity unit
ROI	region of influence
SSTI	subsea tie-in
STL Buoy	submerged turret loading buoy
SUNY	State University of New York
YOY	young-of-year

1.0 Introduction

In 1976, the Magnuson-Stevens Act (MSA) was passed in order to promote fish conservation and management. The MSA granted the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NOAA Fisheries; also known as NMFS) legislative authority for fisheries regulation in the United States within a jurisdictional area located between 3 and 200 nautical miles offshore, depending on geographical location. This area is known as the Exclusive Economic Zone, or EEZ. NOAA Fisheries established eight regional fishery management councils, each responsible for the proper management and harvest of finfish and shellfish resources within their respective geographic regions. Fishery management councils have developed Fisheries Management Plans (FMPs) for species and groups of species, which outline measures to ensure the proper management and harvest of finfish and shellfish within these waters.

Recognizing that many marine fisheries are dependent on nearshore and estuarine environments for at least part of their life cycles, new habitat conservation provisions to the MSA (Public Law 94-265, as amended in 1996 and Public Law 104-297 as amended in 1998) were added, along with other goals, to promote more effective habitat management and protection of marine fisheries. The protection of the marine environments important to marine fisheries, referred to as essential fish habitat (EFH), is required in the review of projects conducted under Federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. 1802(10)). EFH may be designated for several lifestages, including eggs, larvae, juveniles, and adults. Not all species have EFH designated for each of these lifestages, however. Some species may lack the lifestage altogether (e.g., sharks that are viviparous and do not lay eggs) or insufficient information regarding a lifestage may preclude an EFH designation.

Federal agencies that authorize, fund, or undertake activities that may adversely impact EFH (or, the "action agency") must consult with NOAA Fisheries. Although absolute criteria have not been established for conducting EFH consultations, NOAA Fisheries recommends consolidated EFH consultations with interagency coordination procedures required by other statutes, such as the National Environmental Policy Act (NEPA) and Endangered Species Act (ESA), in order to reduce duplication and improve efficiency. Generally, the EFH consultation process includes the following steps:

1) **Notification** – The action agency should clearly state the process being used for EFH consultations (*e.g*., incorporating EFH consultation into the Environmental Impact Statement (EIS) or Rivers and Harbors Act Section 10 permit).

2) **EFH Assessment** – The action agency should prepare an EFH Assessment that includes both identification of affected EFH and an assessment of impacts. Specifically, the EFH Assessment should include: 1) a description of the proposed action; 2) an analysis of the effects (including cumulative effects) of the proposed action on EFH, the managed fish species, and major prey species; 3) the Federal agency's views regarding the effects of the action on EFH; and 4) proposed mitigation, if applicable.

3) **EFH Conservation Recommendations** – After reviewing the EFH Assessment, NOAA Fisheries would provide recommendations to the action agency regarding measures that can be taken by that agency to conserve EFH.

4) **Agency Response** – The action agency may respond to NOAA Fisheries within 30 days of receiving NOAA Fisheries' recommendations to conserve EFH. The action agency will notify NOAA Fisheries that a full response to the conservation recommendations will be provided by a specified completion date agreeable to all parties. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH.

The following sections describe the potential overlap of designated EFH of both state and federally managed species with the region of influence (ROI), identifies those EFH species, and presents the potential impacts of the proposed Port Ambrose Project on EFH. Mitigation and conservation measures are also discussed. A previous EFH Assessment by AECOM (2012) concluded that the proposed Project posed minimal long-term adverse impacts. The effects were determined to be temporary and likely minimized by conservation efforts. Additionally, any effects would be restricted geographically, with no lasting impacts on the New York Bight.

2.0 Project Description

The Applicant proposes to own, construct, and operate an offshore deepwater port in in federal waters of the North Atlantic in the Outer Continental Shelf (OCS) blocks NK 18-12 6708, NK 18-12 6709, and NK 18-12 6758 lease area, approximately 16.1 nautical miles off of Jones Beach, New York and 27.1 nautical miles from the entrance of New York Harbor (see Figure 1). The 18.8-nautical mile subsea Mainline is proposed to connect to the existing Transco Lower New York Bay Lateral in New York State waters, approximately 2.2 nautical miles southwest of Long Beach, New York and 13.1 nautical miles east of Sandy Hook, New Jersey. For the purposes of this final EIS, the proposed Project's major components would include:

- Two subsea submerged turret loading buoys (STL Buoys)
- Two flexible risers
- Two pipeline end manifolds (PLEMs)
- Two 26-inch diameter subsea laterals
- One 18.8-nautical mile, 26-inch diameter subsea Mainline

A full description of the proposed Project and alternatives is provided in Section 2.1 of the final EIS. Fabrication of offshore components would require onshore facilities. A suitable location for a pipe staging and concrete weight coating facility would be selected during the development phase of the proposed Project. Multiple sites on Staten Island, New York, a site on Quonset Point, Rhode Island and a site on Point Coeymans, New York have undergone initial review. The Quonset Point and Port Coeymans have been used for concrete weight coating application operations in the past for offshore pipeline installations.

Liquefied natural gas (LNG) regasification vessels (LNGRVs) that would call on the port facilities would be purpose built for the proposed Project. Liberty anticipates that the LNGRVs would be registered under the Norwegian International Ship Register through a long-term agreement with Höegh.

Construction of the proposed Project is anticipated to take approximately 20 months over two calendar years. Off-site vessel fabrication and pre-construction activities would commence in late 2017 and take approximately 9 to 12 months. Off-site vessel fabrication and pre-construction would occur overseas and would not be under the jurisdiction of general conformity. Onshore construction at the local pipe staging and CWC facility would begin in eary 2018 and take approximately four months. Installation of the offshore components would begin in early 2018 and would take approximately nine months to complete. Construction and installation of the proposed Project would be completed in late fourth quarter 2018. The proposed Project would be designed, constructed, and operated in accordance with applicable codes and standards and would have an expected operating life of approximately 25 years.

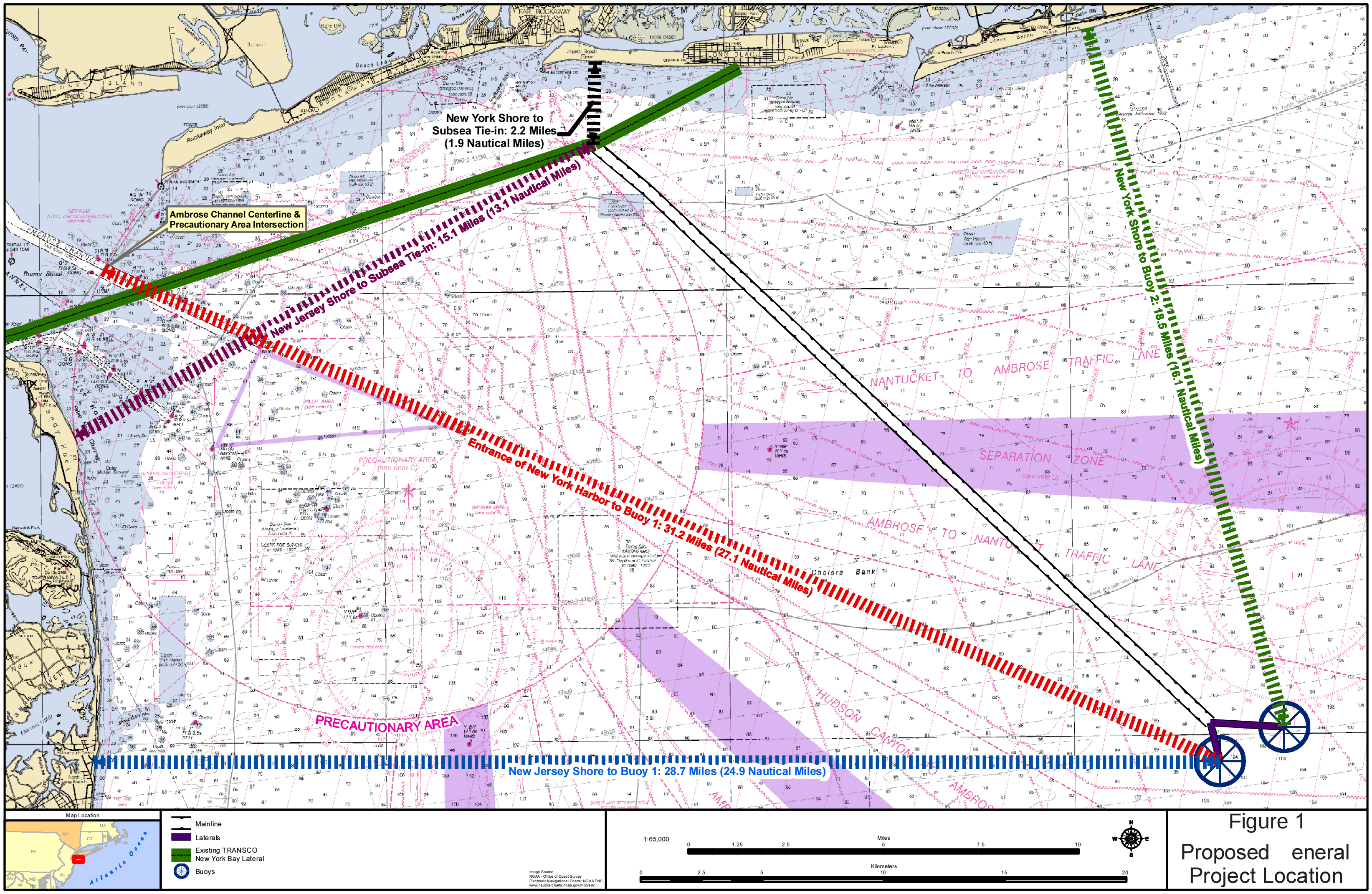

Figure 1. **Proposed General Project Location**

3.0 Essential Fish Habitat

The MSA (16 USC §1801 et seq.), as amended by the Sustainable Fisheries Act, mandates identification and conservation of EFH. The 1996 amendments to the MSA require that federal agencies consult with NOAA Fisheries and prepare an EFH Assessment if a project may adversely affect important habitats of federally managed marine and anadromous fish species. Fish is defined as "finfish, mollusks, crustaceans, and all other forms of marine animals and plant life other than marine mammals and birds."

EFH is defined as those waters and substrates necessary (required to support a sustainable fishery and the managed species) to fish for spawning, breeding, feeding, or growth to maturity (i.e., full lifecycle) (16 U.S.C. 1802[10]). These waters include aquatic areas and their associated physical, chemical, and biological properties used by fish, and may include areas historically used by fish. Federal agencies are required to consult with NOAA Fisheries and to prepare an EFH Assessment if potential adverse effects on EFH are anticipated from their activities.

NOAA Fisheries further clarified the terms associated with EFH (50 CFR 600.05 through 600.930) with the following definitions:

> **Waters—**Aquatic areas and their associated physical, chemical, and biological properties that are used by fish and, where appropriate, may include aquatic areas historically used by fish;
>
> **Substrate—**Sediments, hard bottoms, structures underlying the waters, and associated biological communities;
>
> **Necessary—**The habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem;
>
> **Spawning, breeding, feeding, or growth to maturity—**Stages representing a species' full life cycle; and
>
> **Adverse effect—**impacts that reduce the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species, and their habitat, and other ecosystem components. Adverse effects may be site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

The fishery management councils classify EFH for federally managed species in terms of five basic lifestages: eggs, larvae, juveniles, adults, and spawning adults (GMFMC 1998, 2005, 2010; MAFMC and ASMFC 1998; NEFMC 1999, 2004). NOAA Fisheries categorizes the lifestages of managed, highly migratory species somewhat differently, resulting in three categories based on common habitat usage by all lifestages in each group: (1) spawning adult, egg, and larvae; (2) juvenile and subadult; and (3) adult (NMFS 2009). Additionally, NOAA Fisheries classifies EFH for sharks in terms of three lifestages, based on the most current research and the general habitat shifts that accompany each developmental stage: (1) neonate (primarily includes newborns and only small young-of-the-year); (2) juvenile (includes all immature sharks from young to older/late juveniles); and (3) adult (sexually mature sharks; largest size class) (NMFS 2009).

3.1 Fishery Management Councils

The ROI falls within the jurisdictional boundaries of the Mid-Atlantic Fishery Management Council (MAFMC), although there is also overlap of species ranges, and EFH, that are managed by the New England Fishery Management Council (NEFMC). The MAFMC includes New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and part of North Carolina. The NEFMC includes Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut. The two councils share jurisdiction across several different FMPs. NOAA Fisheries jurisdiction includes all federally managed waters of the United States where highly migratory species occur, generally in pelagic waters of the open-ocean and nearshore waters from three nautical miles offshore to the boundary of the U.S. EEZ, usually 200 nautical miles offshore. The species with designated EFH are included in Table 1 by habitat type (benthic/demersal, benthic/demersal and water column, and water column) with lifestage, fishery management council, and FMP information.

3.2 Designated EFH

The ROI would be contained within portions of five 10-minute by 10-minute EFH squares (Table 1; Figure 2). The estimated acreage of impact is based on the detailed project description in Section 2.1 of the final EIS, then broken down according to the proportion of each project component within each EFH block. The effect of construction and operation on EFH is discussed in Section 4 of this EFH Assessment. Only those species of fish and invertebrates that have EFH designations for all or part of their lifestages within these blocks are described in the following section and summarized in Table 2. The information from these 10-minute blocks is based primarily on offshore trawl survey data collected by NOAA, which was subsequently used to support the regional Fishery Management Councils designations of EFH (NOAA/NMFS/NERO 2013).

Table 1. Project Impact Overlap with Designated EFH

EFH Block Reference Number	Coordinates of Southeast Corner	Project Component within Block (Milepost)	Area of Construction Overlap (Acres)	Area of Operation Overlap (Acres)	Depths (5-meter Intervals)	Sediment Type
1	40°30’ N 73°40’ W	Pipeline (21.67-18); CYA SSTI	50.1	0	10-20	Sand
2	40°30’ N 73°30’ W	Pipeline (18-17)	17.1	0	15-20	Sand
3	40°20’ N 73°30’ W	Pipeline (17-5)	107.3	0	15-30	Sand and gravel
4	40°20’ N 73°20’ W	Pipeline (5-0); Laterals; Port	61.8	1.1	25-35	Sand and gravel-sand
5	40°10’ N 73°20’ W	Laterals; Port	10.1	2.1	30-35	Sand and gravel-sand

The MAFMC used two methods for developing the EFH designation maps. The first method used the average catch rates per ‘10-minute square,’ while the second method focused on percentages of observed range. The percentage of observed range method gathered data for all planktonic life history stages (eggs and larvae for most species, and juvenile and adult Atlantic herring) during NOAA Fisheries bottom trawl surveys and the Marine Resources Monitoring, Assessment, and Prediction (MARMAP) survey program. These data were used to develop the observed range for each species, which was based on species presence/absence for each in all ‘10-minute square’ locations (NOAA/NMFS/NERO 2013).

EFH designation for highly migratory species is based on the movements and habitat use of these species. Ichthyoplankton surveys were used to delineate spawning and nursery grounds for highly migratory species. Feeding grounds vary on seasonal or temporal scales and are typically associated with water column features that coincide with upwelling, convergences zones, and other features.

NOAA Fisheries, MAFMC, and the NEFMC have designated EFH within their FMPs. The specific EFH designations for each of the species within the FMPs are listed in the EFH source documents maintained by NOAA Fisheries on the EFH Mapper and Data Inventory (NOAA Fisheries 2014). This tool is updated, as needed, with the addition of amendments to FMPs.

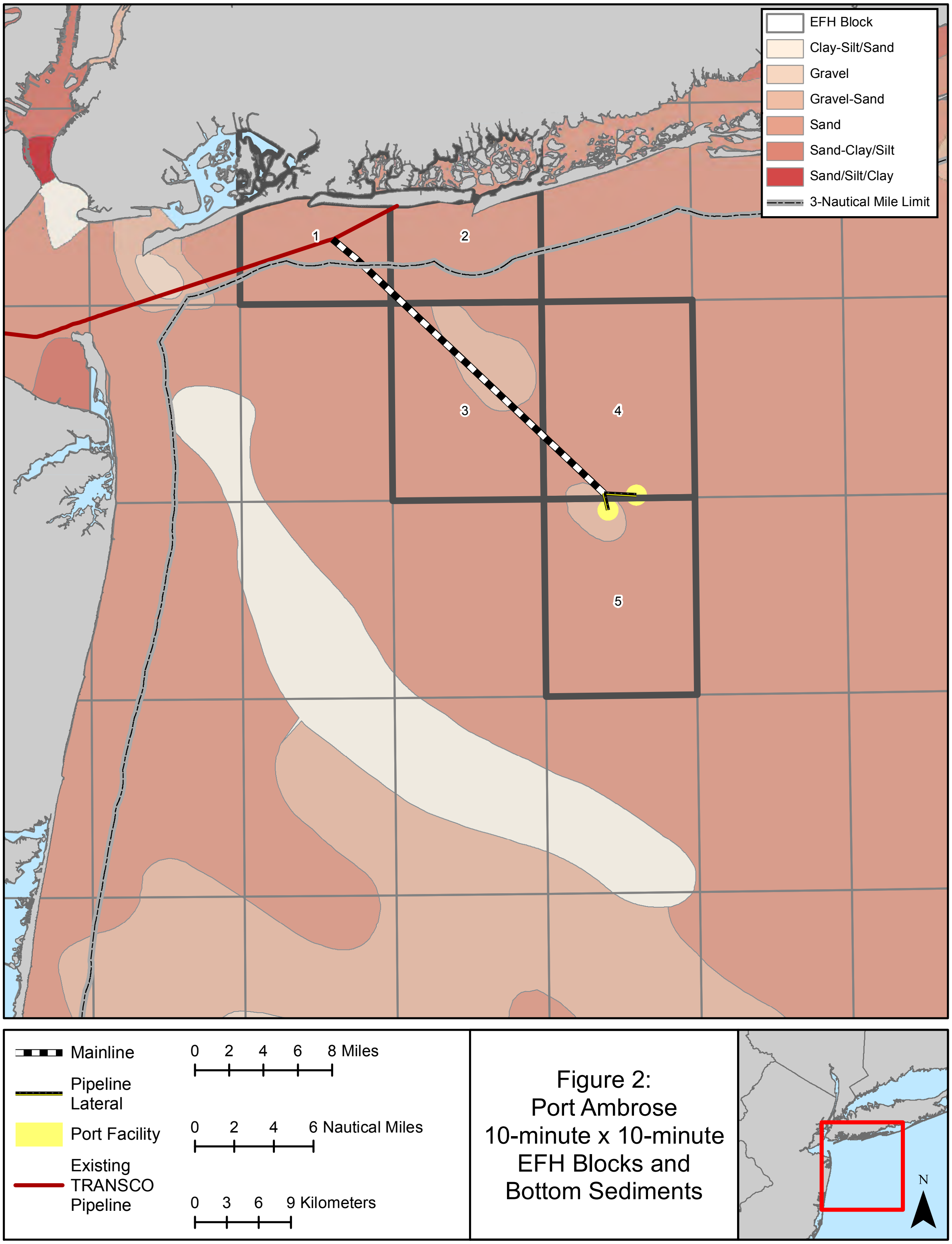

Figure 2. **Proposed Port Ambrose 10-minute by 10-minute EFH Blocks and Bottom Sediments**

3.3 Designated Habitat Areas of Particular Concern

The MAFMC has designated habitat areas of particular concern (HAPC) for summer flounder around submerged aquatic vegetation and macroalgae patches, which serve as nursery areas for juvenile and larval summer flounder. The MAFMC has also designated HAPC for tilefish as clay outcrop/pueblo habitats within Norfolk, Veatch, Lydonia, and Oceanographer Canyons. The NEFMC designated discrete HAPC for Atlantic cod and Atlantic salmon because of their habitat associations over gravel/cobble bottoms on Georges Bank, and specific coastal river systems, respectively. However, none of these HAPCs are located in the vicinity of the ROI, and they are not discussed further.

3.4 Managed Species and Habitat

EFH-designated species and life history stages in the ROI were identified based on a list in the NOAA Guide to EFH Designations in the Northeastern United States (NOAA/NMFS/NERO 2013) for the 10-minute by 10-minute area of latitude and longitude blocks indicated in Table 1. EFH designations for coastal finfish and shellfish species in this area were also based on information compiled by NOAA Fisheries and the regional fishery management councils, located on the EFH Mapper Tool (NOAA/NMFS/NERO 2013), and the EFH source documents contained within each of the EFH text descriptions. A total of 23 bony fish, ten sharks, two skates, one mollusk, and two bivalve shellfish are currently designated as EFH species in this area (Table 2). Each EFH-designated species and the corresponding designated lifestages found in the ROI are presented in Table 2.

Available information on life history and habitat requirements for each EFH-designated species is summarized in this section. Primary reference sources are cited once, at the end of each summary, with additional citations provided as appropriate. For most species, the primary source was one of a series of EFH source documents prepared by NOAA Fisheries in 1999. Several other sources are also identified. Designated life history stages (eggs, larvae, juveniles, and adults for finfish; pre-recruits and recruits for squid; and early and late juveniles, neonates, and adults for sharks) are identified at the beginning of each species assessment and in Table 2.

Statements regarding the likelihood of occurrence of each species and life history stage in the ROI are presented at the end of each species assessment. In making this determination, emphasis was given to the depth and water quality preferences of eggs, larvae, neonates, juveniles, and adults, and their association with the type of sandy substrates that exist in the ROI. Information on depth and substrate preferences is important because the Ambrose Channel is a relatively deep channel that cuts through an otherwise shallow area of the nearshore continental shelf, with sand as the predominant bottom substrate. Another important factor is whether the bottom sediments (sand) in the ROI provide suitable habitat for invertebrates that are preyed upon by bottom feeding EFH species. Available information on feeding habits of EFH-designated species and on benthic resources in the ROI is presented within individual species descriptions below.

Table 2. Federally Managed Species with EFH Designated in the ROI

Habitat	Species	Lifestage Occurrence in ROI (EFH Block)				Primary Fishery Management Council	Fishery Management Plan (FMP)
		E	L/N	J	A		
Benthic/ Demersal	Atlantic surfclam (*Spisula solidissima*)			X (3, 4)	X (3, 4)	Mid-Atlantic	Atlantic Surf Clam and Ocean Quahog
	Little skate (*Leucoraja erinacea*)	NA		X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)	New England	Skate Complex
	Ocean quahog (*Artica islandica*)			X (3)	X (3, 4)	Mid-Atlantic, NOAA Fisheries	Atlantic Surf Clam and Ocean Quahog
	Ocean pout (*Macrozoarces americanus*)	X (3, 4, 5)	X (3, 4, 5)		X (3, 4, 5)	New England	Multispecies
	Pollock (*Pollachius virens*)			X (1, 2)		New England	Multispecies
	Winter skate (*Leucoraja ocellata*)	NA		X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)	New England	Skate Complex
Water Column & Benthic/ Demersal	Atlantic sea herring (*Clupea harengus*)			X (2, 3, 4, 5)	X (1, 2, 4)	New England	Atlantic Herring
	Black sea bass (*Centropristis striata*)			X (1, 2, 4, 5)	X (2, 3, 4)	Mid-Atlantic, ASMFC	Summer Flounder, Scup, and Black Sea Bass
	Longfin squid (*Loligo pealeii*)			X (2, 3, 4, 5)	X (5)	Mid-Atlantic	Atlantic Mackerel, Squid, and Butterfish
	Monkfish (*Lophius americanus*)	X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)		X (1)	New England	Monkfish
	Red hake (*Urophycis chuss*)	X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)		New England	Small Mesh Multispecies
	Scup (*Stenotomus chrysops*)			X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)	Mid-Atlantic, ASMFC	Summer Flounder, Scup, and Black Sea Bass
	Spiny dogfish (*Squalus acanthias*)	NA		X (5)		Mid-Atlantic	Spiny Dogfish
	Summer flounder (*Paralichthys dentatus*)		X (3, 5)	X (1, 2, 3, 4)	X (1, 2, 3, 4, 5)	Mid-Atlantic, ASMFC	Summer Flounder, Scup, and Black Sea Bass
	Whiting/silver hake (*Merluccius bilinearis*)	X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)		New England	Small Mesh Multispecies
	Windowpane flounder (*Scophthalmus aquosus*)	X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)	X (1, 2, 3, 4)	X (1, 2, 3, 4, 5)	New England	Multispecies

Habitat	Species	Lifestage Occurrence in ROI (EFH Block)				Primary Fishery Management Council	Fishery Management Plan (FMP)
		E	L/N	J	A		
	Winter flounder (*Pseudopleuronectes americanus*)	X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)	New England	Multispecies
	Yellowtail flounder (*Limanda ferruginea*)	X (3, 4, 5)	X (3, 5)	X (3, 5)	X (3, 4, 5)	New England	Multispecies
Water Column	Atlantic butterfish (*Peprilus triacanthus*)	X (1, 2)	X (1, 2)	X (1, 2, 3)	X (1, 2)	Mid-Atlantic	Atlantic Mackerel, Squid, and Butterfish
	Atlantic mackerel (*Scomber scombrus*)	X (1, 2, 5)	X (1, 2)	X (1, 2)	X (1, 2)	Mid-Atlantic	Atlantic Mackerel, Squid, and Butterfish
	Atlantic salmon (*Salmo salar*)				X (1, 2)	New England	Atlantic Salmon
	Basking shark (*Cetophinus maximus*)	NA			X (5)	NOAA Fisheries	Highly Migratory Species
	Blue shark (*Prionace glauca*)	NA	X (3, 4, 5)	X (5)	X (1, 2, 3, 4, 5)	NOAA Fisheries	Highly Migratory Species
	Bluefin tuna (*Thunnus thynnus*)			X (3, 4, 5)	X (3, 4, 5)	NOAA Fisheries	Highly Migratory Species
	Bluefish (*Pomatomus saltatrix*)			X (1, 2, 3, 4)	X (1, 2, 3, 4, 5)	Mid-Atlantic, ASMFC	Bluefish
	Cobia (*Rachycentron canadum*)	X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)	South Atlantic	Coastal Migratory Pelagics
	Common thresher shark (*Alopias vulpinus*)	NA	X (4, 5)	X (4, 5)	X (4, 5)	NOAA Fisheries	Highly Migratory Species
	Dusky shark (*Carcharhinus obscurus*)	NA	X (1, 2, 3, 4)	X (3, 4, 5)		NOAA Fisheries	Highly Migratory Species
	Haddock (*Melanogrammus aeglefinus*)		X (5)			New England	Multispecies
	King mackerel (*Scomberomorus cavalla*)	X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)	South Atlantic	Coastal Migratory Pelagics
	Sandbar shark (*Carcharhinus plumbeus*)	NA	X (1, 2, 3, 4)	X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)	NOAA Fisheries	Highly Migratory Species

Habitat	Species	Lifestage Occurrence in ROI (EFH Block)				Primary Fishery Management Council	Fishery Management Plan (FMP)
		E	L/N	J	A		
	Sand tiger shark (*Carcharias taurus*)	NA	X (1, 2, 3, 4)			NOAA Fisheries	Highly Migratory Species
	Shortfin mako shark (*Isurus oxyrinchus*)	NA	X (3, 4, 5)	X (3, 4, 5)	X (3, 4, 5)	NOAA Fisheries	Highly Migratory Species
	Skipjack tuna (*Katsuwonus pelamis*)				X (3, 4, 5)	NOAA Fisheries	Highly Migratory Species
	Spanish mackerel (*Scomberomorus maculatus*)	X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)	X (1, 2, 3, 4, 5)	South Atlantic	Coastal Migratory Pelagics
	Tiger shark (*Galeocerdo cuvieri*)	NA	X (1, 2, 3, 4, 5)	X (3, 4, 5)		NOAA Fisheries	Highly Migratory Species
	White shark (*Carcharodon carcharias*)	NA		X (3, 4, 5)		NOAA Fisheries	Highly Migratory Species
	Witch flounder (*Glyptocephalus cynoglossus*)	X (3)				New England	Multispecies

NOTE: Species lifestages for which EFH is designated are indicated by E = Eggs, L/N = Larvae (fish)/ Neonates (sharks), J = Juveniles, A = Adults. For simplicity, squid, which are usually categorized as pre-recruits and recruits, were grouped as juveniles or adults. If a lifestage does not exist for a species, it is indicated as NA.

3.4.1 Benthic/Demersal Species

Atlantic Surfclam *(Spisula solidissima):* Adults and Juveniles

The Atlantic surfclam is a filter-feeding marine bivalve commonly found in sandy sediments along the northeast coast of the United States (Weinberg et al. 2005). The surfclam is found on the continental shelf of eastern North America and is distributed from the Gulf of St. Lawrence, Canada, to Cape Hatteras in North Carolina (Cargnelli et al. 1999d). The southern boundary of the Atlantic surfclam is directly related to water temperature. Laboratory results suggest that their optimal water temperature is around 20°C (Weinberg et al. 2005). Most commercial concentrations of Atlantic surfclams occur off the coast of New Jersey, the Delmarva Peninsula, and around Georges Bank (Jacobson and Weinberg 2006). Atlantic surfclams can be found in large groups known as clam beds in predominantly sandy substrates. Throughout most of the surfclam's range, adults and juveniles are found in water temperature ranges from 2 to 30°C. EFH for juvenile and adult surfclams exists throughout the substrate to a depth of 3 feet below the water/substrate interface from the Gulf of Maine and eastern Georges Bank throughout the Atlantic EEZ in coarse sand and gravel. They are most abundant in water depths of less than 240 feet; in fact, water depths of less than 124 feet tend to house greater surfclam densities in the Mid-Atlantic region (Jacobson and Weinberg 2006). These bivalves may occur within the ROI. Adults and juvenile Atlantic surfclams have had EFH designations within blocks 3 and 4 of the ROI. (Primary Source: Weinberg et al. 2005)

Little Skate *(Leucoraja erinacea):* Adults and Juveniles

The little skate is a demersal fish that occurs in the northwest Atlantic Ocean, from Nova Scotia, Canada to Cape Hatteras, North Carolina, but it is most abundant around the Mid-Atlantic Bight and Georges Bank. Temperature-driven movements into offshore waters during winter months are common, but not all little skates display migratory behavior. Mating occurs year-round, but reproduction peaks in late fall (October-December) and spring (April-May). Leathery egg cases are attached to bottom substrates with adhesive strings, hatching into fully developed juveniles, 3.6 to 4 inches in length (Richards et al. 1963; McEachran 2002), within approximately six months, though gestation time appears to be temperature-dependent. Adults average 16 to 20 inches total length but have been calculated as reaching up to 24 inches. The little skate diet consists primarily of decapod crustaceans and amphipods, as well as polychaetes.

Preferred habitat is the same for adult and juvenile little skate. They are most often found in depths less than 364 feet but have been observed as deep as 1,260 feet. In the New York Bight, juveniles are found at a mean depth of less than 140 feet. Little skate are found in shallow water more often in spring and deeper water in winter. They may be found on sand, gravel, or mud, from 15 to 32 practical salinity units (psu). Although little skate can tolerate a wider temperature range, they are most often found between 2 and 15°C.

EFH for adult and juvenile little skate has been designated as sand, gravel, or mud bottom substrate from Georges Bank to Cape Hatteras, North Carolina, including the Mid-Atlantic Bight. Depth of EFH ranges from 0 (shore) to 449 feet, with peak abundances at 240 to 300 feet. Most little skate are found in temperatures between 4 and 15°C. Blocks 1, 2, 3, 4, and 5 in the ROI has been designated as EFH for both juvenile and adult little skate. Due to their range and habitat preference, little skate are likely to be found in the ROI. (Primary source: NEFMC 2003; Packer et al. 2003a)

Ocean Quahog *(Arctica islandica):* Adults and Juveniles

Ocean quahogs are extremely slow-growing and long-lived filter-feeding marine bivalves. Adults are usually found in dense beds 80 to 200 feet below the ocean surface in medium to fine grain sand, sandy mud, and silty sand. They are restricted to cooler waters where temperatures rarely exceed 20°C and are capable of surviving low dissolved oxygen (DO) levels. Quahogs feed on phytoplankton, pumped in using a short siphon. Spawning is protracted, lasting from spring to fall. In New Jersey, reproduction has been reported to last from September to November, and sometimes until January.

EFH for adult and juvenile ocean quahog has been described as throughout the bottom substrate, to a depth of 3 feet below the sediment/water interface, within federal waters from the eastern edge of Georges Bank and the Gulf of Maine throughout the Atlantic EEZ (Cargnelli et al. 1999c). Adult and juvenile quahogs are common in sandy sediments in the Mid-Atlantic Bight and have EFH designated in blocks 3 (juveniles and adults) and 4 (adults) of the ROI. (Primary Source: Cargnelli et al. 1999c)

Ocean Pout *(Macrozoarces americanus):* Adults, Larvae, and Eggs

Ocean pout commonly occur from Labrador, Canada and the southern Grand Banks to Maryland (Dunaway 2001). They lay demersal eggs in gelatinous clumps within sheltered areas where either one or both of the parents guard them (Steimle et al. 1999c; Wigley 2000). Upon hatching, larvae remain near the sheltered area throughout the duration of the transition stage into juveniles, when the fish disperse along the shallow, coastal waters. Juveniles are typically found in association with rocks and attached algae (Klein-MacPhee 2002a), while adults commonly occur in the deeper, cooler waters (3 to 14ºC) of the continental shelf and the upper continental slope (Clark and Livingstone 1982; Steimle et al. 1999c).

Spawning occurs in late summer through early winter (peak in September through October) with earlier peaks (August through October) in the southern part of their range. This species spawns on hard bottom, sheltered areas (Klein-MacPhee and Collette 2002), including rock crevices, artificial reefs, and shipwrecks, at depths of less than 164 feet and temperatures of 10°C or less (Clark and Livingstone 1982; Steimle et al. 1999c). Although ocean pout move seasonally within a region to remain at preferred temperatures, this species is considered nonmigratory (Klein-MacPhee 2002a), and seasonal inshore/offshore movements are not extensive (Wigley 2000).

EFH for all lifestages is designated as bottom habitats, primarily hard bottom, on the continental shelf from the Gulf of Maine, Georges Bank, and Mid-Atlantic Bight south to Delaware Bay. Generally, the following conditions exist where ocean pout egg/larvae and juveniles are found: sea surface temperatures below 10°C (eggs, larvae) or below 14°C (juveniles), depths less than 164 feet, and salinities greater than 25 psu. EFH for adults includes water temperatures below 15°C, depths less than 360 feet, and a salinity range from 32 to 34 psu. EFH has been designated for adults, larvae, and egg lifestages, all in blocks 3, 4, and 5 in the ROI. Ocean pout may be found in the ROI. (Primary Source: NEFMC 1998d)

Pollock *(Pollachius virens):* Juveniles

Pollock inhabit the continental waters of both sides of the North Atlantic (Mayo 1998). In the northwestern Atlantic Ocean, pollock occur from Hudson and Davis Straits to North Carolina but are rare at the extremes of the range (Klein-MacPhee 2002b). Spawning occurs in the late fall and winter and typically coincides with a decline in temperature (Mayo 1998; Klein-MacPhee 2002b). Pollock undergo onshore-offshore migrations due to temperature shifts and north-south movements in relation to spawning events (Klein-MacPhee 2002b).

EFH is designated only for juveniles in blocks 1 and 2 within the ROI, as areas with vegetation or substrate composition of sand, mud, or rock in the Gulf of Maine and Georges Bank. Generally, the following conditions exist where pollock juveniles are found: water temperatures below 18°C, depths from 0 to 820 feet, and salinities between 29 and 32 psu. Pollock inhabit cooler, more northerly waters and are therefore unlikely to be found in the ROI in any regular occurrence. (Primary Source: NEFMC 1998e)

Winter Skate *(Leucoraja ocellata):* Adults and Juveniles

Winter skates occur from coastal southern Newfoundland and the southern Gulf of St. Lawrence to Cape Hatteras, North Carolina (McEachran 2002; Packer et al. 2003b). Winter skates are most frequently found in habitats containing sandy to gravelly bottoms (McEachran 2002). The eggs of winter skates are laid on the bottom in capsules (McEachran 2002; Packer et al. 2003b). Upon hatching, the skates are already fully developed juveniles (NEFMC 2003). During the spring, juvenile winter skates are most common in waters with temperatures of 4 to 5ºC, salinities of 32 to 33 psu, and depths of 36 to 230 feet. In the fall, juveniles are typically observed in waters with temperatures of 7 to 16ºC (peaks between 13 and 15ºC), salinities between 32 and 33 psu, and depths ranging from 69 to 262 feet (Packer et al. 2003b). In spring, adult winter skates are most abundant in waters ranging from 4 to 6ºC in temperature, salinities of 33 psu, and depths of 102 to 197 feet, while during the fall, adults are most commonly distributed in waters with temperatures ranging from 11 to 15ºC, salinities of 32 psu, and depths of 102 to 164 feet (Packer et al. 2003b).

Juvenile and adult winter skate designated EFH is described as bottom habitat with sand and gravel or mud in the following areas: Cape Cod Bay, Georges Bank, southern New England shelf, and the Mid-Atlantic Bight to North Carolina. In addition, juvenile EFH includes Buzzards Bay to Raritan Bay and in the Chesapeake Bay. Adult EFH includes Buzzards Bay to Delaware Bay and Chesapeake Bay. Among these EFH designations, the ROI includes EFH in blocks 1, 2, 3, 4, and 5 for adult and juvenile winter skates. Based on the habitat requirements of juveniles and adults, they may occur in the ROI. (Primary Source: NEFMC 2003)

3.4.2 Benthic/Demersal and Water Column Species

Atlantic Sea Herring *(Clupea harengus):* Juveniles and Adults

Adult Atlantic sea herring migrate south into southern New England and mid-Atlantic shelf waters in the winter after spawning in the Gulf of Maine, on Georges Bank, and Nantucket Shoals (Overholtz 2006). Juvenile and adult herring are abundant in coastal and mid-shelf waters from southern New England to Cape Hatteras in the winter and spring. In the spring, adults return north, but juveniles do not undertake coastal migrations. Larval herring are limited almost exclusively to Georges Bank and the Gulf of Maine waters. Larvae typically metamorphose the following spring into young-of-year (YOY) juveniles.

EFH for juvenile (blocks 2, 3, 4, and 5) and adult (blocks 1, 2, and 4) Atlantic herring has been designated within the ROI. In the Hudson-Raritan Estuary (HRE), Atlantic herring prefer water depths greater than 25 feet. Atlantic herring in the New York Bight generally prefer water depths of more than 60 feet. Due to the temperature and depth preference of this species, juvenile and adult Atlantic herring are likely to occupy the water column in the ROI during the winter and spring. (Primary Source: Reid et al. 1999; NEFMC 1998a)

Black Sea Bass *(Centropristis striata):* Juveniles and Adults

Black sea bass are usually strongly associated with structured, sheltering habitats such as reefs and wrecks. Spawning occurs on the continental shelf, beginning in the spring off Cape Hatteras and progressing into the fall in the New York Bight and off southern New England. When larvae reach 0.4 to 0.6 inch total length, they tend to settle and become demersal on structured inshore habitat such as sponge beds. In the Mid-Atlantic Bight, recently settled juveniles move into coastal estuarine nursery areas between July and September. The estuarine nursery habitat of YOY black sea bass is relatively shallow, hard bottom with some kind of natural or man-made structure, including amphipod tubes, eelgrass, sponges, artificial reefs and shellfish beds with salinities above 8 psu. Black sea bass do not tolerate cold inshore winter conditions. Following an overwintering period presumably spent on the continental shelf, older juveniles return to inshore estuaries in late spring and early summer. They are uncommon in open, unvegetated, sandy intertidal flats or beaches. Like juveniles, adult sea bass are very structure-oriented, especially during their summer coastal residency. Unlike juveniles, adults only enter larger estuaries and are most abundant along the outer Atlantic coast. Larger fish tend to be found in deeper water than smaller fish.

A few juveniles and adults were collected in the 1992–1997 HRE bottom trawl survey in the summer and fall, but in general, juvenile and adult black sea bass are uncommon in the HRE (Stone et al. 1994). Juveniles were more abundant than adults in annual catches and were most abundant in the summer and fall. In the HRE, black sea bass prefer water greater than 30 feet deep. Adults on the Atlantic coast occupy waters deeper than 65 feet in the fall and 260 to 460 feet deep in the winter and spring.

Juvenile black sea bass EFH has been designated in 1, 2, 4, and 5 EFH blocks, and adult EFH designated in blocks 2, 3, and 4 within the area where the proposed Project would be located. Due to the absence of any three-dimensional structure in the Ambrose Channel, black sea bass are unlikely to occupy the ROI in significant numbers. However, a few juveniles or adults may be found on the bottom in the summer and fall. (Primary Source: Steimle et al. 1999a; MAFMC and ASMFC 1998)

Longfin Squid *(Loligo pealeii):* Pre-Recruits and Recruits

This pelagic, schooling species is located across the continental shelf and slope from Newfoundland to the Gulf of Venezuela; however, the principal concentrations occur from Georges Bank to Cape Hatteras, North Carolina (Jacobson 2005; Cargnelli et al. 1999b). Longfin inshore squid are found on mud or sand/mud substrate in water with temperatures greater than 8°C (Lange and Sissenwine 1980). Juveniles inhabit the upper 33 feet of the water column over water 164 to 328 feet deep and prefer water temperatures ranging from 10 to 26°C. Adult longfin inshore squid inhabit waters over the continental shelf and upper continental slope to depths of 1,312 feet (Cargnelli et al. 1999b). This species is typically demersal during the day and utilizes the water column at night (Vecchione 1981).

This species seasonally migrates inshore and offshore in relation to bottom water temperatures, moving offshore during late fall to overwinter along the edge of the continental shelf and moving inshore during the spring and early summer to spawn (Lange and Sissenwine1980; MAFMC 1998). During winter and early spring when inshore waters are coldest, the population concentrates along the outer edge of the continental shelf where waters are 9 to 13°C. The inshore and northerly movement to the shelf regions occurs when water temperatures start rising (MAFMC 1998; Cargnelli et al. 1999b).

EFH for longfin squid has been designated for recruits and pre-recruits within the ROI. EFH is designated as pelagic waters found over the continental shelf in areas that comprise the highest 75 percent of the catch where juvenile and adult longfin inshore squids were collected in NOAA Fisheries Northeast Fisheries Science Center (NEFSC) trawl surveys from the Gulf of Maine through Cape Hatteras, North Carolina (MAFMC 1998). EFH for pre-recruits has been identified within the ROI, in blocks 2, 3, 4, and 5; EFH for adults has been designated in block 5. Loligo squid are likely to be found in the ROI. (Primary Source: MAFMC 1998; Cargnelli et al. 1999b)

Monkfish *(Lophius americanus):* Adult, Larvae, and Eggs

Monkfish are solitary fish that make seasonal onshore-offshore migrations in response to water temperature and can be found over a variety of substrates. Spawning locations are not well known but are thought to be on inshore shoals and in offshore southern New England, Mid-Atlantic Bight, and Gulf of Maine shelf waters. Monkfish eggs are dispersed within buoyant, ribbon-like, non-adhesive mucoid veils or rafts from February to August. They are rarely collected in surveys but have been reported in open coastal bays and sounds (e.g., Long Island Sound) in low numbers. Larvae have been collected in offshore waters in the Mid-Atlantic Bight during March and April. They are seldom found inshore, but have been reported in Long Island Sound and the HRE. Larvae have been found off southern New Jersey, south of Long Island, in the New York Bight at depths of 30 to 300 feet, and off southern New England.

Monkfish have had EFH designated within the ROI for adults in block 1, and larval and egg stages in all five blocks. Based on their range of habitat utilization, a few monkfish larvae may be found in surface waters in the ROI in June and July. Eggs may occur in surface waters of the ROI as well, likely during a more extended period of time. Adults may be found within the ROI, near the bottom sediment. (Primary Source: Steimle et al. 1999b; NEFMC 1998c)

Red Hake *(Urophycis chuss):* Eggs, Larvae, and Juveniles

Red hake spawn offshore in the Mid-Atlantic Bight in the summer, primarily in southern New England. The distribution of eggs is unknown because the eggs cannot be distinguished from those of other hakes. Larvae dominate the summer ichthyoplankton in the Mid-Atlantic Bight and are most abundant on the mid- and outer continental shelf. Larvae are transported into coastal waters and settle to the bottom in the fall. Juveniles seek shelter and commonly associate with scallops, surfclam shells, and seabed depressions. Juveniles and adults make seasonal migrations in response to changes in water temperatures. In the Mid-Atlantic Bight, red hake are commonly found in coastal waters in the spring and fall and move offshore or into deeper inshore water to avoid warm summer temperatures. Juveniles in the HRE avoid depths less than 30 feet and exhibit a preference for salinities above 27 psu, temperatures above 5°C, and DO concentrations of 10 to 11 milligrams per liter (mg/L).

Juveniles are present year round in the HRE, but are rare in the summer. Larvae are reported to be common in the HRE during June, and juveniles are commonly found from May to November (Stone et al. 1994). Red hake in the HRE prefer depths greater than 35 feet and congregate in the shipping channels. Hake eggs are common in the New York Bight from May to November, but larvae are found primarily further offshore. Juvenile red hake can be found in the New York Bight throughout the year and prefer water 15 to 250 feet deep during the spring and 70 to 250 feet deep during the fall.

Red hake have had EFH designated for all stages except adults within the five EFH blocks ROI. Hake eggs (including eggs of other species besides red hake) are common in the ROI from May to November, but red hake larvae are less likely to occupy shallow coastal waters. Juvenile and adult red hake are attracted to deeper, cooler water in the shipping channels, and thus can be expected to occupy the ROI throughout the year. (Primary Source: Steimle et al. 1999d; NEFMC 1998f)

Scup *(Stenotomus chrysops):* Juveniles and Adults

Scup spawn along the inner continental shelf from Delaware Bay to southern New England between May and August, mainly in bays and sounds in and near southern New England. Scup spawn in the HRE during July. YOY juveniles are commonly found from the intertidal zone to depths of about 100 feet in portions of bays and estuaries where salinities are above 15 psu. Juvenile scup appear to use a variety of coastal intertidal and subtidal sedimentary habitats during their seasonal inshore residency, including sand, mud, mussel beds, and eelgrass beds. Adults move inshore during early May and June between Long Island and Delaware Bay. Adults are found inside bays and sounds, but like juveniles, do not penetrate low salinity areas. Adults are often observed or caught over soft, sandy bottoms and in or near structured habitats, such as rocky ledges, wrecks, artificial reefs, and mussel beds. Adults move offshore once water temperatures fall below 7.5 to 10°C in the fall.

Juveniles and adults are present in the HRE. Juveniles are much more abundant than adults, especially in the spring and summer; however, no juvenile or adult scup are present in the HRE in the winter (Stone et al. 1994). Spawning takes place in July. Juveniles and adults in the HRE prefer depths greater than 30 feet, temperature above 15°C, DO concentrations of 5 to 9 mg/L, and occurs over a wide salinity range (20 to 30 psu). Scup are most common in the Atlantic coast trawl surveys at depths of 35 to 65 feet during the spring and 200 to 400 feet during the summer.

EFH for juvenile and adult scup has been designated in all five blocks in the ROI. Juvenile and adult scup are known to occupy sandy bottom areas, but are more likely to occur on the shallower sandy shoal areas on either side of the deeper Ambrose Channel. Based on their range of habitat utilization, juvenile and adult scup are expected to occupy the ROI during the spring and summer months. (Primary Source: Steimle et al. 1999e; MAFMC and ASMFC 1998)

Spiny Dogfish *(Squalus acanthias):* Juveniles

Spiny dogfish occur from the Gulf of Maine through Cape Hatteras, North Carolina across the continental shelf waters, south of Cape Hatteras through Florida and in estuaries from Passamaquaddy Bay to Saco Bay, Massachusetts Bay and Cape Cod Bay. EFH, which is designated for juveniles in the ROI, is comprised of continental shelf waters and estuaries with preferred water temperatures between 3°C and 28°C. The depth of EFH waters are 33 to 1,280 feet for juveniles.

Only juvenile spiny dogfish have had EFH designated within the ROI, and only in block 5. Based on the habitat requirements of juvenile and adult spiny dogfish, they may occur in the ROI. (Primary Source: MAFMC 2006)

Summer Flounder *(Paralichthys dentatus):* Adults, Juveniles, and Larvae

Summer flounder exhibit strong inshore-offshore movements. Planktonic larvae and post-larvae derived from offshore fall and winter spawning migrate inshore, entering coastal and estuarine nursery areas to complete transformation. Juveniles are distributed inshore and occupy many estuaries during spring, summer, and fall. Some juveniles remain inshore for an entire year before migrating offshore, while others move offshore in the fall and return the following spring. Juvenile summer flounder utilize several different estuarine habitats such as marsh creeks, seagrass beds, mud flats, and open bay areas. Within such suitable habitat, substrate preferences and prey availability are the most important factors affecting distribution. Some studies indicate that juveniles prefer mixed or sandy substrates; others show that mud and vegetated habitats are used. Adult summer flounder inhabit shallow, inshore, and estuarine waters during warmer months and migrate offshore in the fall. Adults are reported to prefer sandy habitats, but can be found in a variety of habitats with both mud and sand substrates.

Adult summer flounder are present in moderate numbers in the HRE during all seasons except winter, and are most abundant in the summer. Juveniles are much less abundant than adults, but are caught throughout the year. In general, adults collected during NOAA Fisheries bottom trawl surveys in the New York Bight showed no particular depth preference at any time of year.

EFH has been designated for larvae (blocks 3 and 5), juveniles (blocks 1, 2, 3, and 4), and adults (blocks 1, 2, 3, 4, and 5) within the ROI. Given their association with sandy substrates and the fact that they feed on a variety of bottom-dwelling invertebrates and fish species that occupy the channel, older juvenile and adult summer flounder are expected to occupy the ROI. Juveniles are likely present in the spring and fall and adults at all times of year except winter. Adults would be most abundant in the fall. YOY juveniles do not occupy offshore coastal habitats and are unlikely to be found in the ROI. (Primary Source: Packer et al. 1999; MAFMC and ASMFC 1998)

Silver Hake or Whiting *(Merluccius bilinearis):* Adults, Juveniles, and Larvae

Whiting, or silver hake, is a demersal species that occur in dense schools and are often associated with specific prey concentrations, spawning requirements, and hydrographic conditions. They spawn on the outer continental shelf. Eggs and larvae are distributed in mid and outer shelf waters, but not in coastal waters. Significant egg production occurs during May to October, with a peak in August. Primary spawning grounds apparently occur between Cape Cod and Montauk Point, New York, on the southeastern slope of Georges Bank, and in Massachusetts Bay. Juveniles are common during spring and summer in relatively shallow waters in southern New England and south of Long Island. Coastal waters off New Jersey, Long Island, and Rhode Island are centers of abundance in the fall. Adults occupy bottom habitats of all substrate types. In general, adults prefer depths between 100 to 1,000 feet and water temperatures below 21°C.

Juvenile whiting are present in the HRE at all times of year except summer, with the highest catch rates in the fall in the Lower Bay. They are caught primarily at depths greater than 30 feet and prefer high DO concentrations (10 to 11 mg/L), high salinities (greater than 27 psu), and a wide range of temperatures (3 to 23°C). Juveniles are present in the New York Bight at all times of year and adults are mostly restricted to the colder months (winter and spring). Juveniles prefer shallower water (80 to 250 feet) during the fall and deeper water (greater than 500 feet) in the spring, while adults prefer depths greater than 150 feet in the fall and greater than 400 feet in the spring. Eggs and larvae are primarily restricted to mid and outer continental shelf waters.

EFH has been designated in the ROI for eggs, larvae, and juveniles in all five EFH blocks. Based on their range of habitat utilization, juvenile whiting can be expected to occupy the ROI throughout the year and adults in the winter and spring. Eggs and larvae are typically dispersed in deeper water, and therefore are not likely to occur in the ROI in significant numbers. (Primary Source: Morse et al. 1999; NEFMC 1999)

Windowpane Flounder *(Scophthalmus aquosus):* All Stages

Windowpane is a shallow water mid- and inner-shelf species found primarily between Georges Bank and Cape Hatteras on fine sandy sediment. Spawning occurs on inner shelf waters, including many coastal bays and sounds, and on Georges Bank. Juveniles and adults are similarly distributed. They are found in most bays and estuaries south of Cape Cod throughout the year at a wide range of depths (less than 5 to 130 feet), bottom temperatures (3 to 12°C in the spring and 9 to 12°C in the fall), and salinities (5.5 to 36 psu). Juveniles that settle in shallow inshore waters move to deeper offshore waters as they grow. Adults primarily occur on sand substrates off southern New England and Mid-Atlantic Bight.

Juveniles and adults are common in the HRE and the New York Bight throughout the year, but are more common in the deeper shipping channels in the HRE in winter and summer. YOY and older juveniles are common within 100 feet of shore. In general, eggs are common in the HRE from April to July and September to October, larvae are common from April to November, and juveniles and adults are common throughout the year (Stone et al. 1994). Eggs are present in the New York Bight from March to December and larvae from May to December.

EFH has been designated within five blocks in the ROI, for all lifestages of the windowpane flounder. Juvenile and adult windowpane are commonly found on shallow, sandy substrates and are expected to occupy the ROI throughout the year. Since this species spawns in inner shelf and nearshore waters, eggs and larvae are expected be found in the ROI at all times of the year except during the winter. Smaller, YOY juveniles prefer shallow water, and therefore are less likely to occupy the ROI than adults and older juveniles. (Primary Source: Chang et al. 1999; NEFMC 1998g)

Winter Flounder *(Pseudopleuronectes americanus):* All Stages

Winter flounder spawning occurs from late winter through early spring, peaking south of Cape Cod in February and March. Eggs are found inshore in waters of 1 to 13.5 feet deep and have been collected in plankton nets offshore (e.g., on Georges Bank at depths of 400 feet or less during March to May). Eggs are adhesive and demersal and are deposited on a variety of substrates, most commonly on sand; they have been found attached to vegetation and on mud and gravel. Larvae are negatively buoyant and non-dispersive; they sink when they stop swimming. Thus, recently settled YOY juveniles are found close to spawning grounds and in high concentrations in depositional areas with low current speeds. YOY juveniles migrate very little in the first summer, move to deeper water in the fall, and remain in deeper cooler water for much of the following year. Habitat utilization by YOY is not consistent across habitat types and is highly variable among systems and from year to year. Adult winter flounder prefer temperatures of 12 to 15°C, DO concentrations greater than 2.9 mg/L, and salinities above 22 psu, although they have been shown to survive at salinities as low as 15 psu.

Juveniles and adults are present in the HRE year-round, but juveniles are less common in the winter (except in the deeper channels) and adults are scarce in the summer. In general, eggs and larvae are abundant in the HRE from October to May, juveniles are abundant from June to November, and adults are abundant from January to April (Stone et al. 1994). In the HRE, one-year-old juveniles and adults prefer depths greater than 35 feet. Larvae have been collected in the New York Bight in March and April. Juveniles and adults are present on the Atlantic coast year round and prefer depths of 15 to 165 feet in the spring and 80 to 250 feet in the fall.

EFH has been designated in all five blocks in the ROI for all lifestages of winter flounder. These fish deposit eggs on sandy continental shelf substrates in depths as great as 400 feet. The sandy habitat of the ROI may provide suitable spawning habitat for this species. In addition, winter flounder would also spawn on the neighboring shoal areas. Due to their range of habitat utilization, juveniles and adults can be expected to be common in the ROI throughout the year. (Primary Source: Pereira et al. 1999; NEFMC 1998h)

Yellowtail Flounder *(Limanda ferruginea):* All Stages

Yellowtail flounder occupy continental shelf waters from the Gulf of St. Lawrence, Labrador to Chesapeake Bay between 35 and 1,200 feet of water, but are more common in depths less than 330 feet. Adults prefer sand or sand-mud sediments. Spawning takes place from March through August, but occurs during March to May in the New York Bight. Eggs are pelagic and found near the surface, primarily in depths of 100 to 300 feet. Larvae have been collected at depths of 35 to 100 feet in April and 100 to 300 feet during May to September. Eggs are commonly observed from mid-March to July and larvae are present in the New York Bight from March to April.

All lifestages of yellowtail flounder have had EFH designated within the ROI; eggs and adults in blocks 3, 4, and 5, and larvae and juveniles in blocks 3 and 5. Based on their range of habitat utilization, yellowtail flounder eggs and larvae are expected to occur in the ROI during spring and summer. (Primary Source: Johnson et al. 1999; NEFMC 1998j)

3.4.3 Water Column Species

Atlantic Butterfish *(Peprilus triacanthus):* All Stages

Butterfish are fast-growing, short-lived, pelagic fish that form loose schools, often near the surface (Cross et al. 1999). Butterfish range from the Gulf of St. Lawrence and the southern coast of Newfoundland to the deeper waters off Florida in the northwestern Atlantic Ocean but are most common between Nova Scotia and Cape Hatteras, North Carolina (Colton 1972; Klein-MacPhee 2002c). All lifestages of the butterfish are common from the outer continental shelf to the lower, high salinity portions of bays and estuaries. Juveniles and adults are common in inshore areas, including the surf zone, and occur in sheltered bays and estuaries in the Mid-Atlantic Bight during the summer and fall. Juveniles and adults are eurythermal and euryhaline, and are frequently found over sand, mud, and mixed substrates. Smaller juveniles often aggregate under floating objects. Juvenile and adult butterfish in the HRE are typically found at depths ranging from 10 to 75 feet with water temperatures ranging from 8 to 26°C, salinities ranging from 19 to 32 psu, and DO ranging from 3 to 10 mg/L.

Butterfish have EFH designated under Amendment 8 to the Atlantic Mackerel, Squid, and Butterfish FMP by the MAFMC (2005). All lifestages have EFH designated in blocks 1 and 2, juveniles also with designated EFH in block 3, within the ROI. Therefore, butterfish are common inhabitants of the water column in shallow water over sandy substrates in the New York Bight and HRE in the summer and fall and are therefore likely to occupy the Ambrose Channel and ROI during those seasons. (Primary Source: Cross et al. 1999; MAFMC 2005)

Atlantic Mackerel *(Scomber scombrus):* All Stages

The Atlantic mackerel is a pelagic species that occurs from the Gulf of St. Lawrence to Cape Lookout, North Carolina. Two spawning groups are located in the northwest Atlantic Ocean but they are managed together. The southern group spawns in the Mid-Atlantic Bight from mid-April to June and the northern group spawns in the Gulf of St. Lawrence from the end of May to mid-August. The southern group begins the spring spawning migration in Delaware Bay and Cape Hatteras and moves northeast along the coast. In April and May, spawning peaks off of New Jersey and Long Island (Studholme et al. 1999). The majority of mackerel eggs are collected over the continental shelf at depths of 98 to 230 feet and larvae are found at depths of less than 164 feet. Juveniles and adults are found from the shore to 1,050 feet.

All lifestages have had EFH designations within blocks 1 and 2, with EFH for eggs also designated in block 5, within the ROI; therefore, any stage may occur in the ROI, although eggs are probably less common in the depths of the ROI. Adult Atlantic mackerel spawn in the Mid-Atlantic Bight in the spring and therefore may occur in larger numbers during that time. (Primary Source: MAFMC 2005)

Atlantic Salmon *(Salmo salar):* Adult

Adult Atlantic salmon are anadromous and pelagic. Wild populations in the United States occur in the Gulf of Maine. After spending two to three years in freshwater, they migrate to the ocean where they spend another two to three years and then return to their natal rivers to spawn (NEFMC 1998b). EFH for adult Atlantic salmon includes all rivers and estuaries listed in the NEFMC EFH Amendment 1998. Adults migrating to spawning grounds require water temperatures below 22.8°C and DO above 5 parts per million (NEFMC 1998b). The ROI contains EFH designated in blocks 1 and 2 for adult Atlantic salmon; however, since they prefer colder water in the Gulf of Maine, they are not likely to be found in the ROI. (Primary Source: NEFMC 1998b)

Basking Shark (*Cetophinus maximus):* Adult

Although the basking shark is the second-largest fish in the ocean, it relies exclusively on some of the smallest marine organisms, plankton. This filter-feeding shark migrates from cold, northern waters in the summer to warmer waters in the winter (Castro 1983), often seeking high densities of copepods. Off of the northeast U.S. coast, basking shark abundances peak from April to October and have been observed south of Long Island, off of Cape Cod, and along Maine's coast (Kenney et al. 1985; Southall et al. 2005). Despite their large size and seasonal appearances, little is known about individual movements year-round. Similarly, there is little data about basking shark reproduction. Courtship behaviors have been documented in the northwest Atlantic Ocean; however, actual mating has not been observed and is thought to happen in deeper waters (Sims et al. 2000; Wilson 2004).

EFH has not been differentiated between the juvenile and adult stages, so it is the same for these two lifestages. Not enough data is available to describe EFH for neonates. For juveniles and adults, EFH occurs along the U.S. East Coast from the northern Outer Banks, North Carolina to the Gulf of Maine. EFH in block 5 has been designated for the adult basking shark within the ROI. This animal may occur within the ROI in the summer months. However, since the ROI is located at the southern end of its range, it is not likely to be found here frequently. (Primary source: NMFS 2009)

Blue Shark *(Prionace glauca):* All Stages

The blue shark has a worldwide distribution and is considered one of the widest ranging shark species (Compagno 1984). Even though its range extends into the tropics, it is commonly found in deeper, more temperate waters (Ferrari and Ferrari 2002). In the western Atlantic, this shark is found from Newfoundland south to Argentina (Compagno 1984). Very little is known about the reproductive locations of this species in the Atlantic, but mating is believed to occur in May and June (Branstetter 2002). Blue shark nurseries are believed to occur in the open oceanic waters of the higher latitudes of their range (NMFS 1999). The exact migration routes of this species are also poorly understood, but a population of blue sharks from the northwest Atlantic Ocean was reported to migrate to northeastern South America (Castro 1983).

EFH has been designated for all stages of the blue shark; neonates in blocks 3, 4, and 5, juveniles in 5, and adults in 1, 2, 3, 4, and 5. For neonates up to 23.6 inches in total length, EFH is designated from New Jersey (N of 40°N) to Massachusetts (25 meters out to EEZ). Juveniles, from 24 to 72 inches long, have EFH designated offshore of Cape Hatteras, North Carolina (45°N) in waters from the 82-foot isobath to the U.S. EEZ boundary. EFH has also been established off the mid-east coast of Florida, South Carolina, and the Gulf of Maine (NMFS 2009). EFH for adults, or individuals over 72.4 inches, is designated from offshore

Cape Hatteras, North Carolina (45°N) in waters from 82 feet to the U.S. EEZ boundary and extending around Cape Cod, Massachusetts, including the southern part of the Gulf of Maine. Additionally, EFH has been designated in localized areas off Puerto Rico and the Virgin Islands (NMFS 2009). These highly mobile sharks may transit the ROI, but individuals are not likely to remain within the area for extended periods of time. (Primary Source: NMFS 2009)

Bluefin Tuna *(Thunnus thynnus):* Adults and Juveniles

Juvenile bluefin tuna are a migratory pelagic species. In the western North Atlantic, bluefin tuna migrate seasonally from spring spawning grounds in the Gulf of Mexico to summer feeding grounds off the northeast U.S. coast. Bluefin tuna often occur over the continental shelf, particularly during the summer months when they feed actively on herring, mackerel, and squids. Juveniles and adults are typically found in inshore and pelagic surface waters warmer than 12°C from Florida to Maine.

EFH has been designated for both adult and juvenile bluefin tuna within blocks 3, 4, and 5 in the ROI. Due to the strong migratory and pelagic nature of this species, juvenile bluefin tuna may occasionally pass through the ROI to feed during the warmer months of the year. (Primary Source: NMFS 2009)

Bluefish *(Pomatomus saltatrix):* Adults and Juveniles

Bluefish spawn offshore in open ocean waters. Eggs in the Mid-Atlantic Bight are generally collected between April through August in temperatures greater than 18°C and normal shelf salinities (greater than 31 psu). Larvae distribution is similar to eggs in preference of water temperature (greater than 18°C) and salinity (greater than 30 psu), and are typically collected between April through September. Juveniles move inshore in early- to mid-June, arriving when temperatures reach approximately 20°C. Juvenile bluefish are found in estuaries, bays, and coastal ocean waters in the Mid-Atlantic Bight and South Atlantic Bight in many habitats. Typically they are found near shorelines, including the surf zone, during the day and in open waters at night. Like adults, they are active swimmers and feed on small forage fish, which are commonly found in nearshore habitats. They remain inshore in water temperatures up to 30°C and return to the continental shelf in the fall when water temperatures reach approximately 15°C. Juvenile bluefish are associated mostly with sand, but are also found over silt and clay bottom substrates. They usually occur at salinities of 23 to 33 psu, but can tolerate salinities as low as 3 psu. Adults are generally oceanic and are found over the continental shelf from Cape Cod Bay, Massachusetts to Cape Hatteras, North Carolina, but are found nearshore in estuaries from Penobscot Bay to Florida (Wood 2013).

One-year-old juveniles and adults are common in the HRE in the summer and fall in fairly shallow (20 feet), and deeper water (40 to 45 feet) in the shipping channels. YOY juveniles are very common in nearshore subtidal and intertidal waters of the HRE in the late spring and summer (USACE 2000). Bluefish of all ages occupy coastal waters in the Mid-Atlantic Bight in the fall. Juveniles and adults are present in the fall and prefer depths greater than 35 feet. Eggs and larvae are present in the New York Bight during the summer and are more commonly found at depths greater than 100 feet.

EFHs for the juvenile (blocks 1, 2, 3, and 4) and adult (all five blocks) stages of bluefish have been designated within the ROI. Based on their range of habitat utilization, a few eggs and larvae may be found in the ROI, but they are more common in deeper, offshore waters. YOY juvenile bluefish prefer coastal embayments and estuaries in the summer, but can be expected to occupy the ROI. Adults are typically pelagic and are expected to occupy the water column of the ROI. (Primary Source: Fahay et al. 1999; GMFMC and SAFMC 2005; MAFMC and ASMFC 1998)

Cobia *(Rachycentron canadum):* All Stages

Cobia occur in the United States from the Mid-Atlantic Bight to Florida and the Gulf of Mexico in seagrass habitat, high salinity bays, and estuaries. It is a southern species that overwinters near the Florida Keys and migrates in the spring and summer to the Mid-Atlantic states to spawn. Larvae are found in both offshore waters and in estuaries. Adults are rarely found as far north as Massachusetts. One YOY juvenile was caught off Cliffwood Beach, New Jersey, with a beach seine within 100 feet of shore in 1999 (USACE 2000). In general, cobia are rare in the HRE (Stone et al. 1994).

All stages of a cobia's life cycle have had EFH designated within all five EFH blocks in the ROI. Cobia are pelagic, warm water species. The ROI is the northern temperature limit for this species; therefore, an occasional adult cobia may occur in the water column of the ROI during the summer, but other life history stages of this species are not likely to be found at the ROI. (Primary Sources: GMFMC and SAFMC 2005)

Common Thresher Shark *(Alopias vulpinus):* All Stages

The thresher shark is a circumglobal oceanic and coastal species that inhabits the tropical and temperate waters of the world (Compagno 1984; Tricas et al. 1997; Jordan 1999). In the northwest Atlantic, they occur from Nova Scotia to Argentina, including the Gulf of Mexico (Branstetter and Burgess 2002). Juvenile thresher sharks inhabit coastal bays and nearshore waters. Adults are more common over the continental shelf but also occur in oceanic waters beyond the shelf break (Jordan 1999; Branstetter and Burgess 2002; Goldman et al. 2009). They are commonly observed at the surface but are known to inhabit depths of up to 1,804 feet (Jordan 1999). Reproduction is thought to occur annually throughout their distributional range (Jordan 1999; Branstetter and Burgess 2002). Young most commonly occur in the waters of the southeast United States, but have also been observed off southern New England (Branstetter and Burgess 2002).

The EFH designation for all stages of the thresher shark's life cycle, including neonate, juvenile, and adult has included the same parameters, and has been designated in blocks 4 and 5. EFH includes pelagic waters deeper than 164 feet offshore Long Island, New York, and coastal southern New England between 70°W and 73.5° W, south to 40°N. Additional Atlantic EFH has been established off the mid-east coast of Florida, Georgia, South Carolina, and the Gulf of Maine, as well as between North Carolina and Cape Cod. EFH has also been designated in localized areas off of Puerto Rico (NMFS 2009). This wide-ranging shark may occur within the ROI, particularly as juveniles. (Primary Source: NMFS 2009)

Dusky Shark *(Charcharinus obscurus):* Neonates and Juveniles

The dusky shark is a large, highly migratory species that is common in warm and temperate continental waters throughout the world. Although nursery areas are in coastal waters, dusky sharks do not prefer areas with reduced salinities and tend to avoid estuaries. Dusky sharks are viviparous. Females move inshore to give birth to their young, then return to deeper water.

Neonates (blocks 1, 2, 3, and 4) and juveniles (blocks 3, 4, and 5) exhibit EFH designations within the 10-minute blocks where the proposed Project is located. Neonates inhabit coastal waters, inlets, and estuaries. Juveniles occur in coastal and pelagic waters. Given their habitat requirements, these lifestages are expected to occur in the ROI. (Primary Source: USDOC 1999; Compagno 1984; NMFS 2009)

Haddock *(Melanogrammus aeglefinus):* Larvae

Haddock is a demersal species found throughout the North Atlantic Ocean. In the northwestern Atlantic Ocean, haddock are distributed from Greenland to Cape Hatteras, North Carolina (Cargnelli et al. 1999a). Areas of highest abundance include Georges Bank, the Scotian Shelf (including Browns Bank), and the southern Grand Bank (Cargnelli et al. 1999a). No long distance migrations are noted for this groundfish in the northwest Atlantic Ocean, only short inshore/offshore movements (Cohen et al. 1990). Juveniles are more abundant inshore, in shallower water with lower temperatures, in autumn than spring, while adults are more abundant offshore in autumn than spring. This most likely reflects the offshore movements to pre-spawning and spawning aggregations. Distribution is influenced more by restrictive spawning area and bottom type conditions than by temperature variation (Cargnelli et al. 1999a). Depths from 131 to 328 feet on Browns Bank and Georges Bank are principal spawning areas for haddock, which typically spawn over substrates of rock, gravel, smooth sand, or mud (Colton 1972; Klein-MacPhee 2002b). Spawning occurs from January to July with a delay occurring in peak spawning time in more northern latitudes (Cohen et al.

1990). For example, on Georges Bank, spawning peaks during March and April and in April and May on Browns Bank (Colton 1972).

EFH for the egg, juvenile, or adult lifestages does not occur in the ROI. EFH for larvae, however, has been designated in block 5 within the ROI. This includes surface waters over Georges Bank southwest to the middle Atlantic south to Delaware Bay. Generally, the following conditions exist where haddock larvae are found: sea surface temperatures below 14°C, water depths from 98 to 295 feet, and salinity ranges from 34 to 36 psu. Haddock larvae are most often observed in these areas from January through July with peaks in April and May. Haddock generally occur further north than the ROI, so it is unlikely that they would be observed within this area. (Primary Sources: Brodziak 2005)

King and Spanish Mackerel *(Scomberomorus cavalla* and *S. maculatus):* All Stages

King and Spanish mackerels are highly migratory epipelagic, neritic fish that migrate north from Florida as far as the Gulf of Maine in the summer and fall. King mackerel spawn in coastal waters of the Gulf of Mexico and off the South Atlantic coast. Thus, only a few adults of this species would be expected to inhabit Mid-Atlantic Bight coastal waters. In contrast, Spanish mackerel spawn as far north as Sandy Hook and Long Island in late August to late September. Both species prefer water temperatures above 20°C.

All lifestages of both mackerel species have had EFH designated in all five blocks within the ROI. Due to temperature preferences and the migratory and epipelagic nature of the Spanish and king mackerels, a few adult Spanish and king mackerels may pass through the ROI to feed during their annual northward migration and when they return south in the fall. Consequently, early lifestages of these species would be rare in the ROI. (Primary Sources: Godcharles and Murphy 1986; Collette and Nauen 1983; GMFMC and SAFMC 2005)

Sandbar Shark *(Charcharinus plumbeus):* All Stages

The sandbar shark is an abundant, coastal-pelagic shark of temperate and tropical waters that occurs inshore and offshore. It is found on continental and insular shelves and is common at bay mouths, in harbors, inside shallow muddy or sandy bays, and at river mouths, but tends to avoid sandy beaches and the surf zone. Sandbar sharks migrate north and south along the Atlantic coast, reaching as far north as Massachusetts in the summer. Sandbar sharks bear live young in shallow Atlantic coastal waters between Great Bay, New Jersey, and Cape Canaveral, Florida. The young inhabit shallow coastal nursery grounds during the summer and move offshore into deeper, warmer water in winter. Late juveniles and adults occupy coastal waters as far north as southern New England and Long Island.

All lifestages of the sandbar shark have had EFH designated within the ROI; neonates in blocks 1, 2, 3, and 4, and juveniles and adults in all five blocks. Sandbar sharks are migratory and coastal-pelagic species. The ROI is an unlikely nursery ground for this species, but late juvenile and adult sandbar sharks are likely to occupy the ROI. (Primary Source: Compagno 1984; USDOC 1999; NMFS 2009)

Sand Tiger Shark *(Carcharias taurus):* Neonates

This large shark is common in coastal marine waters in tropical and temperate climes. Juvenile and adult male sand tiger sharks are found between Cape Cod, Massachusetts down to Cape Hatteras, North Carolina, while adult females prefer waters from Cape Hatteras to Florida (Gilmore 1993). These animals are frequently found in waters less than 13 feet deep (Castro 1983). Although much of the sand tiger's reproductive cycle is unknown, it appears that two young are birthed in early spring in the northwestern Atlantic Ocean (Lucifora et al. 2002). Off of the southeastern United States; however, females may give birth during the winter months, with neonates subsequently migrating north to inhabit nurseries in Mid-Atlantic Bight estuaries, such as the Chesapeake, Delaware, Sandy Hook, and Narragansett Bay.

For neonates (4.2 feet or less total length), EFH has been described as coastal areas of the Atlantic, from northern Florida to Cape Cod. EFH has been designated in blocks 1, 2, 3, and 4 within the ROI only for the neonate stage. Females are not expected to occur in the ROI due to their preference for southern waters. Juveniles and males may transit the ROI, particularly in areas closer to shore. (Primary source: NMFS 2009)

Shortfin Mako Shark *(Isurus oxyrhyncus):* All Stages

The shortfin mako shark is a common, extremely active, offshore littoral and epipelagic species found in tropical and warm temperate waters that is seldom found in waters below 16°C. The shortfin mako shark has a worldwide distribution that ranges from the Grand Banks and Gulf of Maine in the western Atlantic southward to the tropics, including the Gulf of Mexico (Schultz 2004). It is typically common offshore from Cape Cod, Massachusetts, to Cape Hatteras, North Carolina (Castro 1983). This species is typically found from the surface to depths of 499 feet, but has been recorded as deep as 2,428 feet (Compagno 1984; Passarelli et al. 1999). In the extreme northern and southern parts of its range, this species migrates with warm water masses in the summer. Very little is known about the life history of this species, but nursery areas are believed to be located in deep tropical waters.

EFH for neonates, juveniles, and adults have been designated in blocks 3, 4, and 5 within the ROI. These EFH designations for all lifestages are considered the same and have been combined. EFH is designated between 0.03 and 1.1 nautical miles from southeast of Georges Bank (~42° N and 66° W) to Cape Lookout, North Carolina (~35° N) and from 82 and 164 feet offshore from the Chesapeake Bay to a line running west of Long Island, New York to just southwest of Georges Bank (~67° W and 41° N). These broad-ranging animals may be found in the ROI, but due to frequent movement and migrations, this species is not likely to remain in this relatively small area for extended periods of time. (Primary Source: NMFS 2009)

Skipjack Tuna *(Katsuwonus pelamis):* Adults

Skipjack tuna are highly migratory, circumglobal pelagic fish that inhabit tropical and warm-temperate waters and are generally limited by the 15°C isotherm. Skipjack tuna are often found in mixed schools with bluefin tuna of the same size. Like bluefin tuna, skipjack tuna often occur over the continental shelf and in embayments, particularly during the summer months when they feed actively on herring, mackerel, and squid. In the Mid-Atlantic Bight, adults typically occur in pelagic waters where water temperatures range from 20 to 31°C from the 82 to 656-foot isobath.

EFH has only been designated for adult skipjack tuna in blocks 3, 4, and 5 within the ROI. Skipjack tuna are highly migratory and pelagic, and may pass through the ROI to feed during their annual migration. (Primary Source: NMFS 2009)

Tiger Shark *(Galeocerdo cuvieri):* Neonates and Juveniles

Tiger sharks are one of the larger species of shark. They typically inhabit tropical and sub-tropical waters ranging from 10 to 30°C on or adjacent to the continental and insular shelves and make seasonal migrations into warm temperate waters. This species occupies different marine habitats, but seems to prefer turbid waters and deep water on reef fringes during the day and inland waters at night. The nurseries for this species appear to be in offshore areas, but have not been described. Designated EFH for early juveniles is designated as the shallow coastal areas of Cape Canaveral, Florida to Montauk, Long Island, New York from shallow coastal areas to the 660-foot isobath (NOAA/NMFS/NERO 2013).

EFH for neonate (all five blocks) and juvenile (blocks 3, 4, and 5) tiger sharks has been designated within the ROI. Early juvenile tiger sharks are not expected to be found in the ROI due to the lack of habitat and because the ROI is in the northern extreme of their range. (Primary Source: Compagno 1984; USDOC 1999)

White Shark *(Carcharodon carcharias):* Juveniles

White sharks are found worldwide in temperate, subtropical, and tropical waters. In the northwest Atlantic, they occur from Newfoundland to Florida, the northern Gulf of Mexico, the Bahamas, and Cuba, as well as from Brazil to Argentina (Castro 1983; Compagno 1984). This species is principally an epipelagic shark but can be found utilizing depths of over 820 feet ranging from the surfzone to offshore, including oceanic islands (Castro 1983; Compagno 1984; Martins and Knickle 1999). This shark commonly occurs in areas of small coastal archipelagos inhabited by pinnipeds (main prey), offshore reefs, banks, and shoals, as well as rocky headlands where deeper water is closer to shore (Martins and Knickle 1999). Larger individuals are more common in subtropical and tropical waters than smaller white sharks (less than 10 feet in length), which typically are confined to temperate waters (Compagno 1984). Very little is known of the white shark's reproductive behavior and habitat association, but records indicate that live young are born in temperate shelf waters during the spring to late summer (Martins and Knickle 1999). The white shark inhabits waters over the continental shelf in the summer and migrates to warmer waters during the winter months (Castro 1983).

EFH designations for all lifestages of white shark are considered the same and have been combined, though only EFH for juveniles has been designated in the ROI, in blocks 3, 4, and 5. EFH exists along the mid- and southern west coast of Florida in the Gulf of Mexico, and between the mid- and northern east coast of Florida, South Carolina, and North Carolina in the Atlantic. Additional EFH has also been designated between Maryland and Cape Cod, Massachusetts. Offshore EFH has been established along northern New Jersey and Long Island, New York in pelagic waters from the 82 to 328-foot isobath in the New York Bight area bounded to the east at 71.5°W and to the south at 39.5°N. This species also has EFH offshore Cape Canaveral, Florida between the 82 and 323-foot isobaths from the 29.5°N south to 28°N. This animal may be found in the ROI, but it is likely to be transient rather than a year-round resident due to its migratory nature. (Primary Source: NMFS 2009)

Witch Flounder *(Glyptocephalus cynoglossus):* Eggs

Witch flounder inhabit continental shelf waters as deep as 4,920 feet. In U.S. waters, this species occurs on or adjacent to Georges Bank and along the continental shelf edge and upper slope south to Cape Hatteras, North Carolina (Cargnelli et al. 1999e). Adults inhabit mud and clay substrates, or mud and clay mixed with sand, but rarely on sand. Spawning occurs from shore to the outer continental shelf, primarily at depths of 330 to 525 feet, from March through October, but peaks in the Mid-Atlantic Bight between May and June. Eggs are laid at or near the bottom, but rise into the water column where subsequent egg and larval development occurs. Larvae remain in the water column for a long time, from four to six months to a year. Offshore larval surveys indicate that larval witch flounder are evenly distributed over the continental shelf from Cape Hatteras to southwest Nova Scotia. Larvae are present in the New York Bight from May to July, primarily in deep water (165 to 300 feet).

EFH has been designated for witch flounder eggs in block 3 within the ROI. Based on the habitat requirements of larval, juvenile, and adult witch flounder, they are not expected to occupy the ROI. (Primary Source: Luca et al. 1999; NEFMC 1998i)

4.0 Assessment of Impacts

This section identifies the context, intensity, and duration of potential direct, indirect, and cumulative impacts of the proposed deepwater port on the relevant life history stages of EFH-designated species, their habitats, and their prey species that may occur in the ROI. Tables 4 and 5 identify potential direct and indirect impacts for each EFH-designated species. There would be highly localized direct impacts within the footprint of the ROI ranging from temporary (recovery in days to weeks), short-term (recovery in <3 years), long term (recovery in >3 years to <20 years), to permanent (recovery >20 years) on the habitat and associated prey species for the duration of the proposed Project (NOAA Fisheries 2004). However, since the ROI represents only a very small portion of this type of available offshore benthic and water column EFH in the New York Bight, only a commensurately small portion of available EFH is potentially exposed to adverse impacts.

4.1 EFH Assessment Methods

NOAA Fisheries, MAFMC, and NEFMC have designated EFH within the FMPs of each species or group, using methods described in Section 3.2. The specific EFH designations for each of the species within the FMPs are listed in the EFH source documents maintained by NOAA Fisheries on the EFH Mapper and Data Inventory (NOAA Fisheries 2014). This tool is updated, as needed, with the addition of amendments to FMPs.

The activities associated with construction, operation, and decommissioning may have direct and indirect impacts on EFH, which will vary in their expected duration. Table 3 summarizes these potential effects, which do not all apply throughout the ROI or to every species. Species-specific impacts on EFH are outlined below.

Table 3. Summary of Potential Project Impacts on EFH within ROI

Type of Impact	Temporary Recovery (Days to Weeks)	Short-term Recovery (<3 Years)	Long-term Recovery (>3 to <20 Years)	Permanent (>20 Years)	Cumulative
Direct					
Sedimentation/Turbidity	X				
Displacement from Area	X				
Mortality			X		
Loss of Bottom Habitat				X	X
Indirect					
Removal of Prey Resources (Benthic and Planktonic)	X	X			
Reduced Water Quality	X				

To determine the impact of the construction and operation of the proposed Project on EFH within the ROI, the estimated area of impact on each species' designated EFH was calculated. For example, the Atlantic surfclam has EFH designated in blocks 3 and 4 (see Table 2 for EFH block reference information). In EFH block 3, the construction impact is estimated as 107.3 acres, based on the proportional impact area in the block. Block 4 is estimated to contain 61.8 acres of construction impact. Operation impact (i.e., permanent structures) overlaps with surfclam EFH designated in block 4 for an estimated 1.1 acres. This totals 169.1 acres of construction impact, and 1.1 acres of operation impact on Atlantic surfclam.

Recreational fishing is an important industry in the New York Bight, with several prime fishing areas off of the New Jersey and New York coasts, such as the Mud Hole, Atlantic Beach Reef, and Cholera Bank. The proposed Mainline route was specifically sited to avoid these prime fishing areas (see Figure 2 in AECOM 2012), so it is not expected that these areas would be impacted by the proposed Project.

4.2 Impacts of Construction, Operation, and Decommissioning

4.2.1 Impacts on Benthic EFH

Both direct and indirect impacts, ranging from temporary to permanent, may affect benthic EFH from construction, operation, and decommissioning of the proposed Project. Marine fish with egg, larval, or juvenile stages that settle onto the bottom, such as winter flounder, ocean pout, haddock, and surfclam, are susceptible to turbidity-related impacts. Adult fish have significantly greater mobility, and would thus be able to avoid most of the temporary impacts related to construction. Overall turbidity increases would be temporary in duration and localized in scope. As discussed in this section, resuspended sediments would settle quickly (i.e., within hours or days) and displaced finfish and shellfish would be expected to return shortly after construction ceased. Benthic prey resources are also expected to recover within a short-term period (i.e., less than 3 years). Direct, long-term to permanent impacts would affect two shellfish species' EFH in the area, the Atlantic surfclam and ocean quahog, due to mortality and loss of habitat.

Direct and indirect impacts of the proposed Project on benthic EFH are expected at the portion of the seafloor included in the pipeline route and ports. As discussed in Section 2.1.16.4 of the final EIS, proposed Mainline burial depth of 4 feet to the top of pipe would be achieved through the use of plowing or jetting techniques from MP 0.0 to MP 21.67 (18.8 nautical miles). The area between MP 17.0 and MP 20.1 (2.7 nautical miles) through the Ambrose anchorage area would require a burial depth of 7 feet to the top of pipe and would be achieved utilizing a pipeline jet sled after this segment of the proposed Mainline has been plowed. Other methods of pipeline trenching may be employed to assist with lowering the pipeline beneath the existing seabed, including hand-jetting and use of a "mud pump." The "mud pump" is a submersible pump that is capable of either sucking or blowing the seabed materials from the area being excavated and depositing those materials a short distance away from the site, pending completion of the installation processes. Diver hand-jetting would supplement the lowering process in selected areas. These supplemental methods are proposed for use at the subsea tie-in (SSTI) location to the existing Transco Lower New York Bay Lateral and at the collocated "Y" assembly (CYA) location.

In total, approximately 250 acres of seafloor would be impacted by installation of the proposed Mainline and port structures, with the majority of this impact area (243.2 acres) attributable to installation of the pipelines with temporary to long-term recovery expected, and only a small portion (3.2 acres) with permanent impacts.

Models of sediment transport was developed specifically for construction activities associated with the proposed Port Ambrose Project (AECOM 2014a). These models considered construction activities, such as plowing, hand jetting, and excavation, that would disturb sediment. Incorporating local oceanographic and environmental conditions, the models predicted the extent of sediment plumes and deposition. Since state waters consist of 25 percent fines, and federal waters of only 5 percent fines, these areas were analyzed separately, because grain size influences the characteristics and behavior of sediment plumes. The model also took into consideration the added 3 feet of burial depth required within the anchorage area, between milepost (MP) 17.0 and MP 20.1. In state waters, the predicted extent of a sediment plume was up to 10,500 feet, which was for a plume with 25 mg/L suspended solid concentration, from hand jetting. Plumes of high suspended solid concentration (i.e., 100 mg/L) averaged 385 to 919 feet. The maximum area of a 0.2 inch deposition was estimated as 2,541 feet. For federal waters, sediment plumes and deposition were generally lower, due to the smaller proportion of fine-size particles. The maximum plume size was estimated as 7,800 feet, with a concentration of 25 mg/L, due to jet sled activities. On average, sediment plumes with high suspended solid concentrations (i.e., 100 mg/L) were predicted to extend 315 to 1,016 feet. The maximum area of 0.2 inch sediment deposition in federal waters was predicted as 2,485 feet. Maximum values are predicted to occur in isolated areas, while mean values are more representative of a more typical outcome. Therefore, based on mean values, elevated concentrations of suspended solids (in excess of 50 mg/L) are likely to occur within 1,400 feet of the pipeline in state waters and within 700 feet in federal waters. Heavy deposition (of 0.8 inch or greater) is likely to occur within 190 feet of the pipeline in state waters and within 110 feet in federal waters. Therefore, dispersion and sedimentation impacts on benthic resources would be focused around the pipeline during construction activities. Activities that resuspend sediments have the potential to negatively impact early lifestages of susceptible fish species whose egg or larval stages are demersal (USEPA 1976; Colby and Hoss 2004). Turbidity-related impacts often include reductions in growth and feeding rates, and the clogging of respiratory structures. Mobile demersal fish and invertebrates are expected to avoid the area during construction but would return following completion of the construction activities, so turbidity may cause the displacement of marine fishes, which would be direct and temporary. Impacts on demersal fish species from excess suspended sediments from the proposed construction, operation, and decommissioning activities, have the potential to result in four types of effects: (1) no effect; (2) behavioral effects (e.g., alarm reaction or avoidance response); (3) sub-lethal effects (e.g., reduction in feeding rate or feeding success); and (4) lethal effects (e.g., direct mortality from increased predation or significant degradation of habitat) (Newcombe and Jensen 1996). The severity of impacts is typically associated with both the concentration of suspended sediments and the duration of exposure. Turbidity and sedimentation would also result from the anchor chain sweep, but these impacts are discussed in terms of normal operation.

Mortality of benthic organisms would result in loss of benthic prey, which would be a short-term and indirect impact. Additionally, Atlantic surfclam and ocean quahog may experience mortality along the pipeline route and at the site of the ports, a direct impact, but this biomass should be replaced after several years of spawning cycles, so it would be a long-term impact, but it is not expected to have a population-level effect. Typically, following this type of disturbance, a diverse benthic infaunal community would be recolonized from adjacent organisms within a matter of one to three years (Byrnes et al. 2004; Lundquist et al. 2010). Studies conducted on offshore sand borrow areas off the outer New Jersey coast indicate that benthic communities were re-established within eight to nine months, i.e., within one annual recruitment period after dredging (USACE 1999). Larvae of re-colonizing invertebrate species would be available from populations that inhabit the shoal areas adjacent to the pipeline route.

Permanent impacts of the proposed Project on benthic EFH are expected only at the footprint of each of the two landing pads (2,000 square feet each), buoy and tether assemblies, and anchoring, for a total impacted area of 3.2 acres. In addition to this footprint, the anchor chain sweep would increase turbidity and sedimentation in the vicinity of the proposed Project. These effects would last the life of the proposed Project, though are expected to be minor. The impacts of an anchor chain sweep and resulting turbidity and sediment dispersal were modeled for the proposed Calypso LNG Deepwater Port Project (USCG 2008). This model was used as a predictor for the current proposed Port Ambrose LNG Deepwater Port Project, since the projects and environmental conditions are similar. Both projects stipulated eight or nine anchor chains to moor an STL buoy, though total chain length is less for the proposed Port Ambrose Project. Also, bottom sediment is predominantly sands in the ROI of both projects, though the proposed Port Ambrose Project has less fines (silts and clays). Current velocities just above the sediment have been measured as 0.20 to 0.26 feet/second for the proposed Port Ambrose Project, which is less than the median current velocity of 0.43 feet/second measured for the proposed Calypso Project. Turbidity models for Calypso may then be interpreted for the proposed Port Ambrose Project. For the proposed Calypso Project, anchor chain impacts could create suspended sediment concentrations 1 foot above the seafloor that range from 63 to 115 mg/L. If 15 mg/L defines the edge of the sediment plume, the maximum size would range from 558 to 807 feet, with a much smaller average plume. Since the proposed Port Ambrose Project has less anchor chain, a greater proportion of sand-size particles, and lower current velocities, the extent of the sediment plume is expected to be less than that predicted for Calypso. Given the total available undisturbed benthic EFH within the offshore portion of the New York Bight, these permanent impacts would be highly localized and would not result in adverse impacts on benthic EFH. These impacts on benthic-dependent species are summarized in Table 4. Impacts beyond the permanent footprint of the proposed Port and the area encompassing the cable sweep of the STL Buoy anchor chains are anticipated to be temporary to long-term.

There would be no impacts of sedimentation on eelgrass or hard-bottom areas because those habitat types are not present in the ROI or adjacent to the ROI. Long-term sedimentation impacts of maintenance dredging on seagrasses and their associated fauna do not extend over large distances (less than 16 to 33 feet (Sheridan 2004); therefore, there would also be no indirect impacts on these resources elsewhere in New York Bay.

Overall, there would be highly localized direct and indirect impacts on the benthic EFH habitat within the footprint of the dredged area ranging from temporary to permanent for the duration of the proposed Project. However, since the ROI represents only a very small portion of the available benthic EFH in the offshore portion of the New York Bight, substantial adverse impacts on the overall available EFH are not expected.

Table 4. Direct and Indirect Effects of the Proposed Project on Benthic Essential Fish Habitat (EFH) of Federally Managed Species

Duration of Impact on Benthic EFH	Context of Impact	EFH Species Impacted	Spatial Extent of Overlap (Acres)		Remarks (Lifestages Affected)
			Construction	Operation	
Direct Impact – Mortality and Displacement					
Long-Term (Recovery >3 to <20 Years) to Permanent (>20 Years)	Mortality from dredging and displacement from the benthic habitat	Atlantic surfclam	169.1	1.1	Juveniles and adults have EFH listed within the waters of the proposed ROI. Mortality of specimens within dredging zone expected, but long-term recovery of the biomass would occur through repopulation from surrounding source populations once dredging is completed. Permanent loss of habitat would occur in the portion of the port that overlaps with surfclam EFH.
		Ocean quahog	169.1	1.1	Juveniles and adults have EFH listed within the waters of the proposed ROI. Potential exists for mortality of specimens within dredging zone to occur. However, long-term recovery of the biomass would occur through repopulation from surrounding source populations once dredging is completed. Permanent loss of quahog EFH would occur in the area that overlaps with the port.
Direct and Indirect Impact – Displacement and Prey Loss					
Temporary (Recovery Days to Weeks) to Short-term (Recovery <3 Years)	Displacement from the benthic habitat and loss of benthic prey from dredging	Black sea bass	246.4	3.2	Juveniles and adults have EFH within the waters of the ROI; they would be expected to return once the dredging event is completed, but feeding opportunities would be temporarily limited in the ROI due to loss of prey resources.
		Little skate	246.4	3.2	Juveniles and adults have EFH within the waters of the ROI; they would be expected to return once the dredging event is completed, but feeding opportunities would be temporarily limited in the ROI due to loss of prey resources.
		Monkfish	246.4	3.2	Eggs, larvae, and adults have EFH within the ROI. Adults have EFH designated in ROI; would likely avoid dredging activities, returning upon completion. Adults may also lose prey resources.
		Ocean pout	179.2	3.2	Eggs, larvae, and adults have EFH within the ROI; only adults are likely to be displaced temporarily until dredge activities finished. Eggs and larvae are often associated with hardbottom habitat, especially those with crevices, which is not characteristic of the sandy bottom in the ROI. Prey resources may also be diminished during this time.
		Pollock	67.2	0.0	Juveniles have EFH designated in the ROI, which may be displaced temporarily during dredge activities. They may also experience lower prey availability.
		Red hake	246.4	3.2	Only eggs, larvae, and juveniles have EFH within the waters of the ROI. Juveniles would be expected to return once the dredging event is completed, but feeding opportunities would be temporarily limited in the ROI due to loss of prey resources. Eggs and larvae are found in surface waters and would not be impacted by dredging.
		Scup	246.4	3.2	Juveniles and adults have EFH within the waters of the ROI; they would be expected to return once the dredging event is completed, but feeding opportunities would be temporarily limited in the ROI due to loss of prey resources.

Duration of Impact on Benthic EFH	Context of Impact	EFH Species Impacted	Spatial Extent of Overlap (Acres)		Remarks (Lifestages Affected)
			Construction	Operation	
		Summer flounder	246.4	3.2	Larval, juvenile, and adult lifestages have EFH within the waters of the ROI; they would be expected to return once the dredging event is completed, but feeding opportunities would be temporarily limited in the ROI due to loss of prey resources. Larvae would not be expected to be impacted, since they primarily occur in surface waters.
		Whiting/silver hake	246.4	3.2	Egg, larval, and juvenile lifestages have EFH within the waters of the ROI. Juveniles would be expected to return once the dredging event is completed, but feeding opportunities would be temporarily limited in the ROI due to loss of prey resources. Eggs and larvae are found in surface waters and would not be impacted by dredging.
		Windowpane flounder	246.4	3.2	All lifestages have EFH within the waters of the ROI. Juveniles and adults would be expected to return once the dredging event is completed, but feeding opportunities would be temporarily limited in the ROI due to loss of prey resources. Eggs are found in surface waters and larvae in pelagic waters and would not be impacted by dredging.
		Winter flounder	246.4	3.2	All lifestages have EFH within the waters of the ROI. Juveniles and adults would be expected to return once the dredging event is completed, but feeding opportunities would be temporarily limited in the ROI due to loss of prey resources. Eggs and larvae are demersal, but primarily occur in water < 6 meters deep February – June. Some of these eggs and larvae could be directly impacted by the dredge. However, since most winter flounder spawning occurs well outside of the ROI, no population-level impacts are expected.
		Winter skate	246.4	3.2	Juveniles and adults have EFH within the waters of the ROI; they would be expected to return once the dredging event is completed, but feeding opportunities would be temporarily limited in the ROI due to loss of prey resources.
		Yellowtail flounder	179.2	3.2	All lifestages have EFH within the waters of the ROI. Juveniles and adults would be expected to return once the dredging event is completed, but feeding opportunities would be temporarily limited in the ROI due to loss of prey resources. Eggs and larvae are found in offshore pelagic waters and would not be impacted by dredging.

4.2.2 Impacts on Water Column EFH

A direct, impact of temporary turbidity and increased suspended solids in the immediate area may occur during construction, operation, and decommissioning activities, which may result in the displacement of species with designated EFH. Indirect, short-term impacts on the water column are also expected on EFH, such as the removal of prey resources via entrainment. The effect of the loss of fish eggs and larvae on fisheries resources is discussed in Section 4.2.3 of the final EIS. In the context of EFH, then, entrainment effects are considered as an alteration to the biological environment (i.e., prey abundance).

Due to sediment disturbance, the DO may drop from ambient levels temporarily when bottom sediments are re-suspended in the water column, but should return to ambient shortly after dredging ends, as supported by the past 20 years of water quality data within the ROI. Between 1992 and 2003, the State University of New York (SUNY) Stony Brook has been monitoring water quality conditions at the outer portion of the Ambrose channel, near the proposed Project site on a weekly basis. These measurements were collected while dredging was underway (Metzger 1997) and are therefore indicative of potential water quality issues (turbidity, DO, etc.) associated with seafloor disturbances. The data show a natural seasonal cycle in DO concentrations, but no changes that can be attributed to disturbance of the seafloor (e.g., dredging), nor was there any trend toward deteriorating conditions.

The seafloor disturbance, and resulting turbidity within the water column, is expected to result in a direct, temporary impact on water column EFH resources. Turbidity plumes generated at the dredged site are not expected to be significant, since it is primarily coarse-grained sand, which contains only trace amounts of fine-grained material. In addition, any increase in turbidity would be localized and temporary during the construction phase only. As discussed in Section 4.2.1, turbidity associated with construction, operation, and decommissioning would be highly localized. Suspended solid concentrations above 50 mg/L would be found within 1,400 feet of the pipeline in state waters and within 700 feet in federal waters. Heavy sedimentation of 0.8 inch or greater is predicted to occur within 190 feet of the pipeline in state waters and within 110 feet in federal waters. Overall, however, effects would be minimal in the water column; highest turbidity and sedimentation would occur at the seafloor. According to Wilber and Clarke (2001), all levels of total suspended solids expected for this proposed Project are unlikely, in terms of both concentration and duration, to cause either lethal or sub-lethal effects to fish. At most, demersal fish in the immediate area of impact may experience some temporary physiological stress; however, it is more likely that the other concurrent construction activities would elicit a temporary avoidance response and cause the fish to leave the area (Newcombe and Jensen 1996), also a direct, temporary effect.

The location of the buoys offshore minimizes impacts to plankton, since the area has lower densities of fish eggs and larvae. Construction activities are estimated to result in the greatest entrainment mortality. During the construction phase of the proposed Project, estimated entrainment is 44,027,806 eggs and 4,075,044 larval fish (AECOM 2014b), with an additional loss of 5,175,331 eggs and 596,555 larval fish during the added three-foot burial in the anchorage area (AECOM 2014c). This equates to a loss of 24,138 age-1 fish, plus 2,834 age-1 fish from the additional three feet of pipeline lowering, which is an increase of 11.8 percent. Estimated loss during the proposed Project operation is 40,070,732 eggs and 5,986,906 larvae, which equates to 24,106 age-1 fish. Decommissioning is expected to have the least entrainment, with annual losses of 2,573,528 eggs and 296,648 larvae, equivalent to 1,411 age-1 fish. Combined losses during construction, operation/maintenance, and decommissioning correspond to 3,482 pounds of fishery yield worth $2,392.04; far less than 1 percent of annual commercial and recreational harvest. Therefore, entrainment losses of ichthyoplankton, including fish eggs and larvae, would be negligible. This amount is not expected to have a measureable effect on prey abundance or availability for species with EFH in the water column.

The food web may be indirectly affected, for a short-term duration. The removal of fish eggs and larvae would decrease a prey resource in the water column of some species' designated EFH. In addition to their removal, turbidity may impact feeding behavior. Piscivorous fish, in particular, have shown decreased feeding, as well as lower capture success in turbid environments, even at somewhat low levels of 5 to 10 nephelometric turbidity units (NTU) (De Robertis et al. 2003). Planktivorous fish are not affected by turbidity at low light intensity, but do show reduced feeding at high light intensity (De Robertis et al. 2003). There are complex factors affecting the feeding ecology in the ROI, from natural to project-related impacts. The loss of planktonic prey is expected to be short-term, however, and should recover with the next spawning cycle following the completion of construction.

There would be no change in the physical oceanography, such as the salinity regime, tidal flows or height, or water temperature. Therefore, many species will experience no impacts on water column EFH due to the proposed Project, as summarized in Table 5. Pelagic species and lifestages are expected to continue using unaffected portions of the water column during construction, operation, and decommissioning of the proposed Project. Pelagic larval and egg lifestages would be carried through the ROI on prevailing currents and tides, resulting in limited exposure to a very small percentage of the total ichthyoplankton biomass within the water column during construction, operation, and decommissioning activities.

Overall, there would be highly localized temporary and short-term, direct and indirect impacts on the water column habitat resulting from elevated turbidity and entrainment within the proposed Project ROI. However, since the ROI represents only a very small portion of the available water column EFH in the offshore portion of the New York Bight, substantial adverse impacts on the affected water column EFH are not expected.

4.2.3 Summary of EFH Impacts

No observable impact is expected on the following EFH-designated species: Atlantic mackerel, Atlantic salmon, bluefin tuna, haddock, monkfish (eggs and larvae), shortfin mako shark, skipjack tuna, or witch flounder. Direct, temporary impacts via displacement from the water column and indirect, short-term impacts due to the removal of prey resources are expected for the following species with EFH designated: Atlantic butterfish, Atlantic herring, basking shark, blue shark, bluefish, cobia, dusky shark, king mackerel, longfin squid, sandbar shark, sand tiger shark, spiny dogfish, Spanish mackerel, tiger shark, and white shark. The potential does exist for direct, long-term to permanent impacts on the benthic EFH for the following species: Atlantic surfclam and ocean quahog. Direct, temporary impacts are expected from displacement from benthic habitat and indirect, short-term impacts are expected from the removal of prey for the following EFH-designated species: Atlantic cod, black sea bass, little skate, monkfish (adults), ocean pout, pollock, red hake, scup, summer flounder, whiting/silver hake, windowpane flounder, winter flounder, winter skate, and yellowtail flounder. These impacts are compiled in Tables 4 and 5.

The overall potential adverse impacts on the EFH for designated species in the ROI would be highly localized within the ROI, relatively minimal (in comparison to the overall available EFH area) and capable of recovery. Most species with water column EFH feed on more motile epifaunal organisms or on small forage fish, so the indirect, short-term effect would not necessarily affect all fish equally. For any benthic-feeding EFH species, the indirect impact of dredging on local forage habitat area would be short-term, lasting only until the dredged area is re-colonized by new benthic organisms. This process is expected to take less than a year, and no more than 3 years. The proposed Project is expected to have longer-term adverse impacts on the benthic EFH of Atlantic surfclam and ocean quahog within the ROI, with a permanent, though small, loss of benthic EFH for these two species. Despite this small permanent affect on EFH, most affected EFH is expected to occur from natural processes. Therefore, additional mitigation measures are not necessary.

Table 5. Direct and Indirect Effects of the Proposed Project on Water Column Essential Fish Habitat (EFH) of Federally Managed Species

Duration of Impact on Water Column EFH	Context of Impact	EFH Species Impacted	Spatial Extent of Overlap (Acres)		Remarks (Lifestages Affected)
			Construction	Operation	
No Impact					
--	--	Atlantic mackerel	77.3	2.1	All lifestages have EFH within the waters of the ROI, but occur near the surface, away from the dredging.
		Atlantic salmon	67.2	0.0	Transient, extralimital pelagic species. These fish are not expected to be impacted.
		Bluefin tuna	179.2	3.2	Juveniles and adults have EFH listed within the waters of the proposed ROI, but occur near the surface, away from the dredging. Highly mobile epipelagic species, they would avoid areas of dredging.
		Haddock	10.1	2.1	EFH has only been designated for larval haddock, which only occur in surface waters and would thus be away from dredge activities.
		Monkfish	246.4	3.2	Epipelagic eggs and larvae have EFH listed within the proposed ROI, but occur at the surface, away from the dredging.
		Shortfin mako	179.2	3.2	All lifestages have EFH limited to depths greater than 82 feet. While those depths occur in the ROI, because of dredging, the ambient depths surrounding the ROI are approximately 45 feet. The 25-meter isobath is well offshore from the ROI.
		Skipjack tuna	179.2	3.2	Adults have EFH listed within the waters of the proposed ROI, but occur near the surface, away from the dredging. Highly mobile epipelagic species, would avoid areas of dredging.
		Witch flounder	107.3	0.0	Only larvae have EFH within the ROI. Spawning occurs in depths between 330 to 525 feet, therefore larvae would not be found in the ROI.
Direct and Indirect Impact – Displacement and Loss of Prey Resource					
Temporary (Recovery Days to Weeks) to Short-term (Recovery <3 Years)	Displacement from the water column and loss of planktonic prey from entrainment	Atlantic butterfish	174.5	0.0	All lifestages have EFH designated in the ROI; these pelagic fish are expected to evacuate during dredge activities and return following completion.
		Atlantic sea herring	246.4	3.2	Only juveniles and adults have EFH within the ROI; they would be expected to avoid the area during a dredging event, but return once the event is completed.
		Basking shark	10.1	2.1	Adults have EFH listed within the ROI but are efficient, albeit slow, swimmers, expected to avoid dredge activity and return after proposed Project completion.
		Blue shark	246.4	3.2	All lifestages of this wide-ranging species have EFH designated in the ROI; highly mobile, the blue shark is expected to avoid the area during dredging and return upon completion.

Duration of Impact on Water Column EFH	Context of Impact	EFH Species Impacted	Spatial Extent of Overlap (Acres)		Remarks (Lifestages Affected)
			Construction	Operation	
		Bluefish	246.4	3.2	All lifestages are pelagic and have EFH within the waters of the ROI; they would be expected to return once the dredging event is completed.
		Cobia	246.4	3.2	All lifestages have EFH within the waters of the ROI; they would be expected to return once the dredging event is completed.
		Common thresher shark	71.9	3.2	All lifestages have EFH within the waters of the ROI; they would be expected to return once the dredging event is completed.
		Dusky shark	246.4	3.2	The neonate and juvenile stages of dusky shark have EFH within the waters of the ROI; they would be expected to return once the dredging event is completed.
		King mackerel	246.4	3.2	All lifestages have EFH within the waters of the ROI; they would be expected to return once the dredging event is completed.
		Longfin squid	196.3	3.2	Both juveniles and adults (pre-recruits and recruits) of longfin squid are pelagic and have EFH within the waters of the ROI; they would be expected to return once the dredging event is completed.
		Sandbar shark	246.4	3.2	Neonate, juvenile and adult stages of sandbar shark have EFH within the waters of the ROI; they would be expected to return once the dredging event is completed.
		Sand tiger shark	236.3	1.1	Only the neonate larval stage of sand tiger shark has EFH within the waters of the ROI; they would be expected to return once the dredging event is completed.
		Spiny dogfish	10.1	2.1	Only juveniles have EFH within the ROI; they would be expected to avoid the area during a dredging event, but return once the event is completed.
		Spanish mackerel	246.4	3.2	All lifestages have EFH within the waters of the ROI; they would be expected to return once the dredging event is completed.
		Tiger shark	246.4	3.2	The neonate and juvenile stages of tiger shark have EFH within the waters of the ROI; they would be expected to return once the dredging event is completed.
		White shark	179.2	3.2	Juvenile white sharks have had EFH designated in the ROI; they are expected to avoid the area during dredging and return once the event is finished.

5.0 Mitigation Measures

Details of all mitigation measures are discussed in 4.2.8 of the final EIS but are presented here in the context of EFH. Perhaps most importantly, the route of the proposed Mainline was selected to specifically avoid sensitive and delicate habitat (e.g., biogenic reefs, fishing areas, hardbottom areas, submerged aquatic vegetation). This would result in minimal disturbance to habitat that supports high biodiversity and fisheries resources. When possible, vessels with dynamic positioning would be used, preventing damage produced by an anchor. The benthic and water column EFH that may be impacted has been observed to have rapid and high recovery rates, with communities repopulating or returning within days or months of an activity like dredging. Therefore, the proposed Mainline location was selected in order to have a localized and mostly temporary to short-term impact on the EFH in the ROI within the New York Bight.

Additionally, measures have been proposed that would reduce biological and physical impacts. Ballast water recirculation, as opposed to continuous cooling water intake, would minimize the amount of water needed, thus decreasing the risk of impingement and entrainment of fish. Screens, along with reduced intake velocity, would also decrease injury or mortality of fish. Noise, lighting, emissions, and water quality would also be taken into consideration during construction activities. Using mitigation measures, the proposed Project would minimize adverse impacts on marine organisms and the surrounding EFH.

6.0 Conclusions

Within the ROI, 38 federally managed marine species have had EFH designated. The EFH of eight species are not expected to be impacted. Temporary to short-term impacts, such as displacement and/or prey loss, are expected to affect the EFH of 28 of the species. Only two species, the surfclam and quahog, are likely to incur long-term and permanent changes, though these changes would be very localized. Within the footprint of the buoy, all organisms would likely experience direct mortality. Since the buoy would be stationary, this area would not be available for recolonization. However, this slight change in habitat availability is not likely to affect the population abundance of either shellfish. Mitigation measures, such as the selection of the route in non-sensitive habitat, would further minimize negative effects. Most of the disturbance of this ROI within the much larger New York Bight would experience recovery, with no substantial or population-level effects on EFH for federally managed marine resources.

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